RAILROAD GAZETTE

FRIDAY, JANUARY 28.

NEWS OF THE WEEK.

We give below, in a condensed form, the leading news items of the week. These items will be found in detail in their appropriate columns.

MEETINGS THIS WEEK.—Middle & Western States Freight Association in Chicago, Jan. 27.—Central Traffic Association at Chicago.

ELECTIONS.—Mr. J. C. Wrenshall is appointed Receiver of the Danville & New River road.—New York, Ontario & Western makes Thomas Swinyard Assistant to the President; John B. Kerr, Attorney; James E. Childs, General Manager.—J. H. Richards appointed Receiver of the St Louis, Fort Scott & Wichita.

PERSONAL.—Eugene Zimmerman resigns as Vice-President of Cincinnati, Hamilton & Dayton.—Died: I. W. Raymond, formerly Vice-President Pacific Mail and incorporator Panama Railroad.

EARNINGS.—For December 16 roads report gross and 3 net earnings; 5 show increase in gross; 1 shows decrease in gross and 3 in net earnings. Five roads report for November, 3 showing increase and 2 decrease in gross earnings; 4 show increase in net and 1 did not report last year.

TRAFFIC.—Anthracite coal shipments for the week, 469,469; Eastern bituminous, 248,682; coke, 85,478 tons.—Anthracite coal tonnage (official) for the 1886 was 32,136,363 tons, an increase of 1½ per cent. over 1885.—California fruit rates reduced to $300 per car.—Chicago lines will abolish second-class and land tickets.—Cotton receipts interior markets, 76,542; seaports, 155,884 bales. Total cotton in sight to Jan. 21 was 5,195,751 bales.—Kansas City packers making arrangements to ship to Europe *via* New Orleans.—Commissioner Faithorn fixes percentages in Northwestern pools, excepting grain.—Rate on rails from Missouri River to Colorado reduced from $12 to $10 per ton.—South Carolina Railroad Co. contracts for the transportation of iron ore.

CHANGES AND EXTENSIONS.—Canadian Pacific will build the Algoma Branch to Sault Ste. Marie.—Chicago & Indiana Coal road finished between Fair Oaks and La Crosse, Ind.—Chicago, Santa Fe & California contracts for construction between Kansas City and Mississippi River.—Cincinnati, Indianapolis, St. Louis & Chicago will make a direct connection between St. Louis and Cincinnati.—Danville, Paxton & Mendota will begin work on road in Illinois in the spring.—Delaware & Hudson Canal Co. will build branch from Honesdale, Pa., to Canton.—Gainesville, Henrietta & Western lets contracts for new buildings. Georgia, Carolina & Northern send two corps of engineers into the field.—Gulf, Colorado & Santa Fe continues grading from Paris, Tex., to Ledonia.—Houston & Texas Central contracts let for depot at Houston, Tex.—Lehigh Valley may extend its Hazelton & Freeland Branch to White Haven, Pa.—New York Central & Hudson River Co. will possibly build into Northern New York.—Ohio River road awards contract for extension from Point Pleasant to Huntington, Va.—Oregon Pacific Co.'s new bridge over the Willamette River, Oregon.—Republican Valley & Wyoming will build new road in Nebraska.—Pennsylvania Schuylkill Valley will be completed to Neseopre, Pa., by April 1.—Philadelphia, Wilmington & Baltimore will lay double track on Delaware division.—St. Louis & San Francisco will extend line from Salem, Mo., to Little Rock, Ark.—Seattle, Lake Shore & Eastern surveying new lines in Washington Territory.—The Peruvian Government calls for tenders for railroad construction.—New track reported for the week, 17; year to date, 60 miles.

LEASES, SALES, ETC.—Atchison, Topeka & Santa Fe will probably connect east of St. Louis with the Toledo, St. Louis & Kansas.—Atlantic & Danville may be taken up by Northern capitalists and operated as a rival to the Norfolk & Western.—Suits against the Baltimore & Ohio by the Republic, O., disaster sufferers.—Fitchburg stockholders vote to confirm the previous votes authorizing the issue of new stock and to confirm purchase of Ashburnham Railroad Co.—Missouri Pacific may obtain seaboard outlets at Newport News, Va., and New Orleans, La.—Poughkeepsie, Hartford & Boston changes its name.—St. Louis & St. Joseph Co. files suits for $400,000 against the Missouri Pacific and the St. Louis, Iron Mountain & Southern.

FORECLOSURES AND REORGANIZATIONS.—Indiana, Bloomington & Western, the Cincinnati, Sandusky & Cleveland, and the Columbus, Springfield & Cincinnati will be consolidated as the Columbus, Sandusky, Indianapolis & Western.—Lake Erie & Western reports nearly all securities deposited under plan of reorganization.—Philadelphia & Reading mortgage bondholders meet in Philadelphia.—Richmond & Allegheny issues amended plan of reorganization.—Shenango & Allegheny road sale is postponed 60 days.—Judge Cooley, as Receiver of Wabash, refuses control of the Eel River road tendered by Receivers Humphreys and Tait.

NEW COMPANIES ORGANIZED.—Alabama Midland at Montgomery, Ala.—Arkansas City & Delhi at Little Rock, Ark.—Denver, Boulder & National Park at Denver, Col.—Duluth, St. Cloud, Mankato & Southern in Minnesota.—Fort Scott, Natchez & New Orleans at Helena, Ark.—Kansas Valley at Topeka, Kan.—Lake Erie, Alliance & Southern at Columbus, O.—Lake Geneva & Pacific, Madison, Wis.—Peoria & Joliet Co., in Illinois.—Put-in Bay, Port Clinton & Southern at Ottawa City, Ohio.—South Pittsburgh & Sequatchie in Tennessee.—Topeka, Blue Valley & Northwestern in Kansas.

IN CONGRESS.—Senate passes a bill for a new bridge across the Mississippi in St. Louis.—House passes Inter-state Commerce bill.

REPORTS AND FINANCIAL.—Chicago, Santa Fe & California issues $15,000,000 first mortgage bonds.—Columbus, Hocking Valley & Toledo recovers missing securities to the amount of $946,000.—Fitchburg for 1886 shows gains of 17.6 per cent. gross and 13.8 net. Dividends, 5 per cent.—Des Moines & Fort Dodge for 1886 shows decrease of 11 gross and 27½ per cent. net.—Maine Central for 1886 shows gain of 5.4 per cent. gross and 5.7 net. Dividends, 6 per cent.—New York, Providence & Boston for 1886 shows increase of 8½ per cent. in gross, decrease of 0½ in net. Dividends, 8 per cent.—Northern of New Jersey for 1886 shows gain of 5 per cent. gross, but loss of 1½ net. Dividends, 4 per cent.—Northern Pacific defeats the government in a suit for $1,100,000.—Oregon & Transcontinental Co. reports $22,873,193 assets, $7,137,500 liabilities.—Wilmington, Columbia & Augusta shows increase of 0.7 per cent. in gross, and decrease of 18.5 per cent. net earnings. Dividends, 6 per cent.—Wilmington & Weldon reports increase of 4.3 per cent. gross and 0.3 net; dividends, 8 per cent.

Passenger Locomotive, Caledonian Railway, Scotland.

The accompanying engravings represent a heavy passenger engine, which is a fair sample of modern practice in Great Britain. It will be observed that it differs principally from modern American express engines in having inside cylinders, slightly larger driving-wheels, and in not being equalized between the main and hind drivers. The weight, general dimensions, tractive power and some other important features are very similar. In matters of detail, however, the methods of construction differ greatly. The manner in which the crank pin end of the connecting rod is formed may be instanced. The brasses are held in place by a cap secured by two bolts, parallel with the length of the rod. The rod is forked, and the brasses are consequently supported top and bottom throughout their entire length by the solid metal, and the bolts are consequently relieved of all cross strains and are only in tension. This form of rod is a modification of that nearly universal in marine engines and has been used by Mr. Stroudley and Mr. Drummond for many years. They contend that it can be wholly made by machine work, and is cheaper, more durable and more easily adjusted than any other form of connecting-rod end. It, however, appears to be best adapted to large crank pins, and would perhaps look rather cumbersome on an outside connected engine.

The slide-bars as shown in fig. 5 are another peculiar feature, being composed of cast iron, the top and bottom bars being cast in one piece, channel section. As it was found that cast-iron bars, properly surfaced and lubricated, did not wear perceptibly, means for letting them together were unnecessary, and therefore they are cast solid, shutting out the dust and giving great rigidity to the bars. The two slide-bars give the rubbing surface of the ordinary arrangement of four bars.

The most striking feature about the engine is, however, the valve gear. It is worked from the cross-head and from the connecting-rod, no eccentrics being used. It appears somewhat complicated, but the name of the inventor, Mr. Bryce Douglas, is a guarantee that the gear is worth something. Judged by his works, he is, perhaps, the *greatest* mechanical engineer living, for he has designed the huge engines of all the fastest ocean steamers, the Stirling Castle, Alaska, Aller, Etruria and many others. These engines have been so successful that the name of Bryce Douglas carries great weight; but it must be confessed his valve gear seems somewhat complicated for a locomotive. The distribution of steam is very good, and is shown in the following table. The cut-off, release, etc., in the working notches is very even, except that the port opening is less in the front port.

Table showing distribution of steam. Bryce Douglas Valve Motion.

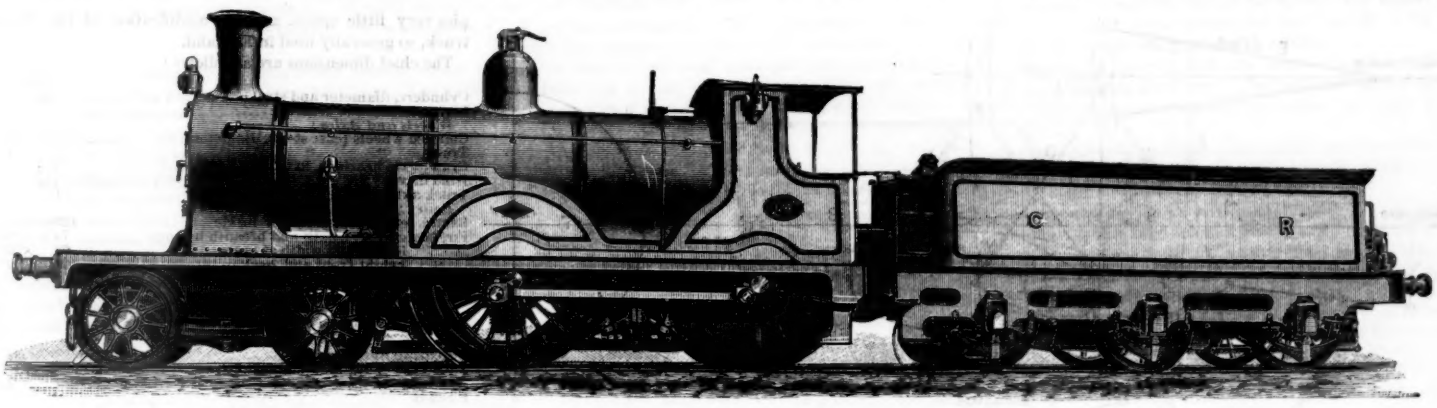
FORWARD GEAR.

Lead.		Cut-off. Per cent.		Difference.	Release. Per cent.		Travel. Ins.	Port opening.		Compression. Per cent.	
F.P.	B.P.	F.P.	B.P.		F.P.	B.P.		F.P.	B.P.	F.P.	B.P.
		75	76½	1½	93	91½	4¼	1 1/16	1 1/16	7	8¼
		60	60½	½	88	87	3 1/16	13/32	13/32	12	13
⅛ in.		50	49	1	84	84	3 1/16	½	15/32	16	16
all gears		40	40	0	79½	79½	2 1/32	5/16	½	20½	20½
		30	30	0	73½	74	2 1/32	1/4	5/16	26½	26

BACKWARD GEAR.

		75	78	3	94	91½	4¼	1	1 1/32	6	8¼
		60	66	6	89	87	3 1/16	3/8	¾	11	13
3/32	4/32	50	57½	7½	85	83½	2 1/32	5/16	7/16	15	16½
all gears		40	47½	7½	80½	80	2 1/16	¼	11/32	19½	20
		30	37	7	75½	76½	2 1/16	3/16	5/32	24½	24½

Fig. 2 in the accompanying engravings is a diagram showing the path of the various parts of the valve gear.



PASSENGER LOCOMOTIVE, CALEDONIAN RAILWAY.

Fig. 3 is a side elevation of the gear, showing the reversing shaft below the gear, the connection with the connecting-rod, the rocking link *C*, etc., and the valve and valve connecting rod. The steam ports are 16 in. by 1⅝ in., and the valve has 1 in. lap. Figs. 4 and 5 are cross sections of the gear.

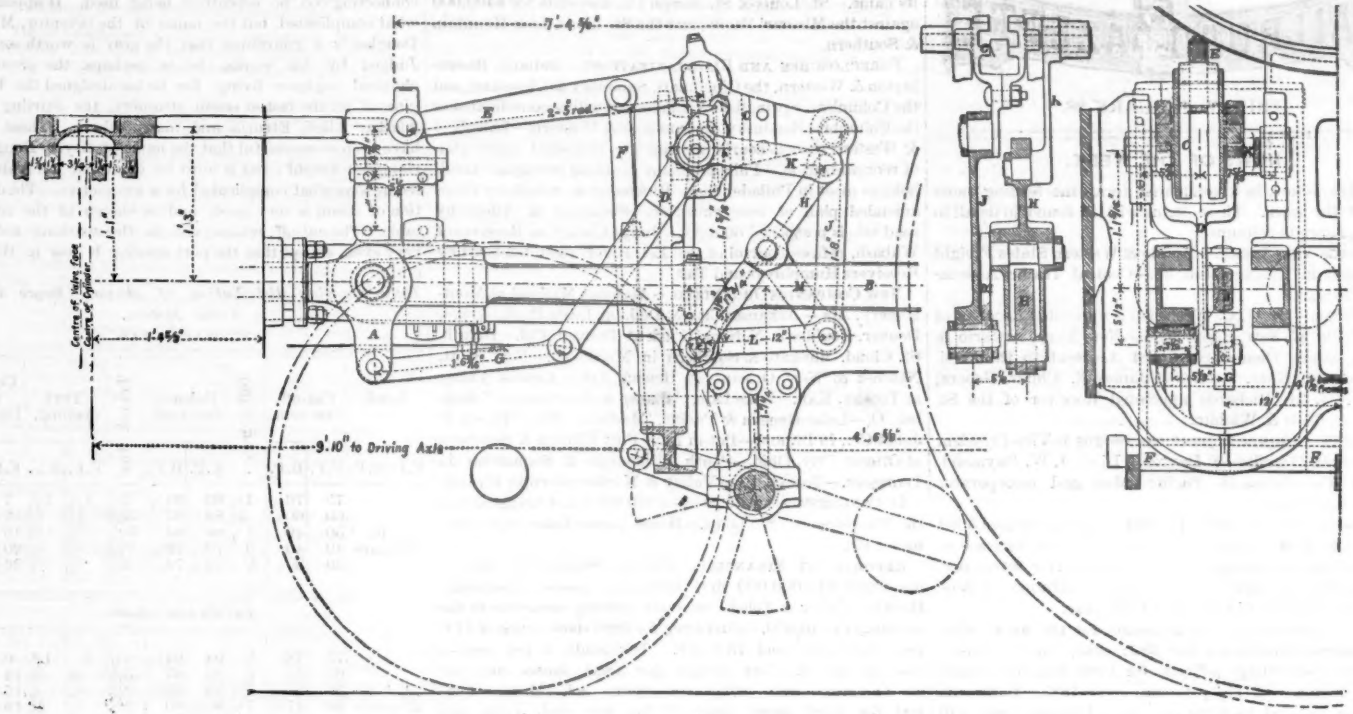
The cross head *A* has coupled to it a connecting-link *G* which connects to the lower end of the vibrating rod *D*, which oscillates on fixed centres near its upper end. Above these fixed centres the rod *D* carries a curved expansion link *C* fitted with the usual sliding block. To this block the valve spindle is connected by the valve connecting rod *E*, the position of which is controlled by the lifting links *F* and the reversing gear.

In addition to being carried bodily to and fro by its connection with the vibrating rod *D*, the expansion link *C* has an oscillating motion imparted to it through an arm at the back of it being coupled to the driving link *J*. The lower end of the driving link *J* has two attachments, namely, first by the connecting link *L* to a fixed point, and, secondly, by the connecting link *M*, to an intermediate point on the driving rod *H*, the lower end of this driving rod *H* being coupled to a point on the connecting-rod of the engine, while its upper end is controlled by the supporting link *K* which connects it to a fixed centre. From the foregoing description the action of the gear can be readily traced out. The reversing gear has a vertical screw, and is placed on the left-hand side of the engine.

It will be seen that when in mid gear the die-block simply travels to and fro, and is not affected by the vertical tipping motion given by the arm *C* to the rod *I*. The die block has no sliding motion as long as the engine is running in the same gear. This is a great advantage which this valve gear shares with a well designed ordinary link motion or the Walshaert valve gear, and which gives it a considerable advantage in durability over the Joy and similar valve gears where the die-block travels the full length of the guide or slot at every stroke of the engine.

The engine and tender illustrated were built by Messrs. Dubs & Co., of Glasgow, and were designed by Mr. D. Drummond, Locomotive Superintendent of the Caledonian Railway. The engines are intended to work the limited mail between Carlisle and Aberdeen. The worst grade is fifteen miles long, seven miles of 70 ft. per mile and eight miles of 63 ft. per mile. This engine was exhibited at the Edinburgh

Fig. 3. Fig. 4. Fig. 5.



Bryce-Douglas Valve gear.

PASSENGER LOCOMOTIVE, CALEDONIAN RAILWAY.

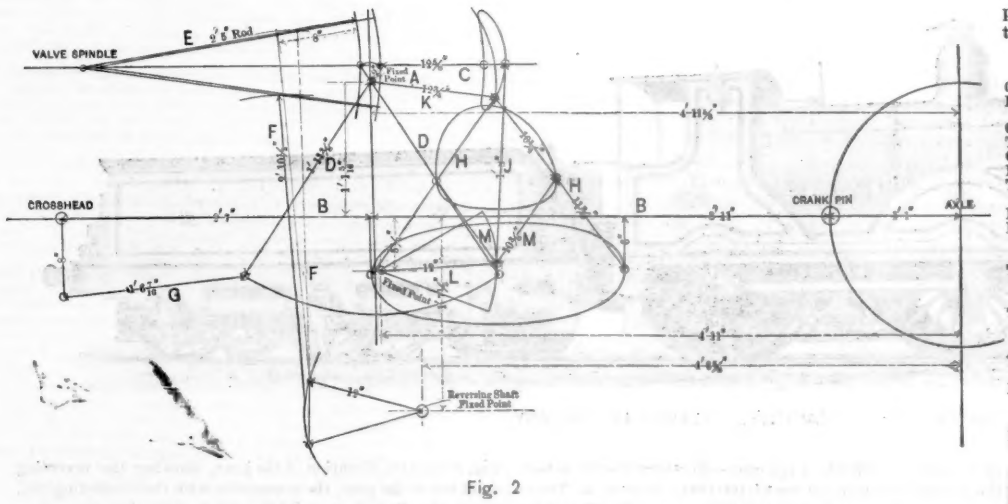


Fig. 2

Diagram of the Bryce-Douglas Valve-gear,

PASSENGER LOCOMOTIVE, CALEDONIAN RAILWAY.

International Exhibition held last year and is the first locomotive fitted with the Bryce Douglas valve-motion.

The boiler is of the usual type: the barrel is constructed of two plates in length, the fire-box being flush with the boiler. The crown of the copper box is stayed to the outer shell by five curved wrought iron girders of "bridge rail" section. From these are slung cast steel link brackets, through the bottom flange of which the suspension stays pass to the roof of the copper box.* This arrangement permits the free expansion of the copper box.

A dome is placed in the middle of the first barrel plate in front of fire-box, and is surmounted with a pair of Ramsbottom's safety valves. It contains the throttle valve of a grid-iron type, with a small easing valve at the back. The ash-pan has double doors with cast-iron frames and doors. The fire door is also of cast iron. It is hinged from the top, and opens inwards towards the fire and serves as a deflector. It can be set at any angle.

The frames of the engine are of Yorkshire iron. The axle-boxes are of gun-metal, sliding in adjustable cast-iron guides fitted on both sides of horn-blocks. The load on the driving wheels is carried on four Timmis's spiral springs, while the load on the hind drivers is supported on laminated springs with 3 ft. 6 in. centres. The truck has laminated springs with 4 ft. centres.

The engine is fitted with a modification of the Westinghouse driver brake, the air acting on top of the piston and driving the cams downward. No piston-rod cup leather is then required, and the rod is not exposed to dirt and mud. The Westinghouse air-pump is on the right-hand side, the reservoir being placed under the hind platform. Two cast-iron sand-boxes, forming part of the driving splashers, are supplied with sand-cocks worked from the foot-plate. Two organ whistles are used instead of the ordinary kind. The engine is also fitted with two injectors, two sets of glass-water-gauge apparatus, and one of Bourdon's duplex pressure gauges.

*An illustration of a very similar boiler will be found on figs. 420 to 423 in the enlarged edition of "*Recent Locomotives*," recently published.

The axles of both engine and tender are of Yorkshire iron, while the engine tyres are of crucible, and the tender tyres of Bessemer steel. The centres of both the bogie and the tender wheels are steel castings, while the centres of the coupled wheels are of wrought iron.

The tender has six wheels, each 48 in. diameter. It is clothed with sheet iron ⅛ in. thick, and has an air space of ⅝ in. between the upper tank plates and the casing. As part of the exhaust is returned to the tender tank, the water becomes highly heated, and would blister the paint unless some clothing were used. The tank has a well which forms part of the inner frame. The framing is of "Siemens steel." The tender is fitted with a hand brake in connection with the Westinghouse brake, the arrangement being such as to permit of separate or combined action.

It will be noticed that a lamp is secured to the side of the cab. It is thus close to the engineer should it require re-trimming, and serves both as a signal lamp when going ahead and as a tail lamp. When setting off or picking up cars at junctions or way stations, it is, of course, well to carry tail lamps on the tender in order to show the whereabouts of the engine on a dark night, especially where the switches are all worked from an elevated signal box. The method utilizes the signal or distinguishing lamp as a tail lamp and thus saves two lamps. The objection is that the cab vibrates more than the buffer beam or smoke-box where the lamps are usually carried, and consequently the lamp is more liable to go out and waste oil. This arrangement has, however, been used on the Caledonian for many years. The lamps have plain glass lenses and movable colored slides.

The truck has lateral motion, a cylinder casting fastened firmly to a brace between the frames resting on a sliding block which bears on the truck transomes. The side-play is controlled by two semi-elliptical springs, one being placed on each side of the sliding block. The whole arrangement occupies very little space, and is a modification of the Adams truck, so generally used in England.

The chief dimensions are as follows:

	Inches.
Cylinders, diameter and stroke	19 × 26
Distance between centres	24
Wheels and Axles:	
Coupled wheels (cast steel), diameter	78
Truck " "	42
Crank axle bearings, length and diameter	8½ × 8¼
Hind driver " " " "	7½ × 7½
Truck axle " " " "	9 × 6
Boiler:	
Barrel, length and diameter inside	123½ × 52
Firebox casing, length and breadth bottom	74⅜ × 48½
" length and width at grate	68 × 42⅛
" height front and back	74 and 68
Thickness of plates, firebox casing	⅝
" " boiler barrel	11/16
" " smoke-box tube-plate	¾
Thickness of plates, copper fire-box	½
" " tube-plate	⅝
Heating Surface:	sq. ft.
Tubes 216 of 1¾ in. diameter = area	1047 2
" 10 of 1½ " = "	41.5
Firebox = "	122.0
Total heating surface	1210.7
Grate area	19.5
Working boiler pressure	160 lbs. per sq. in.

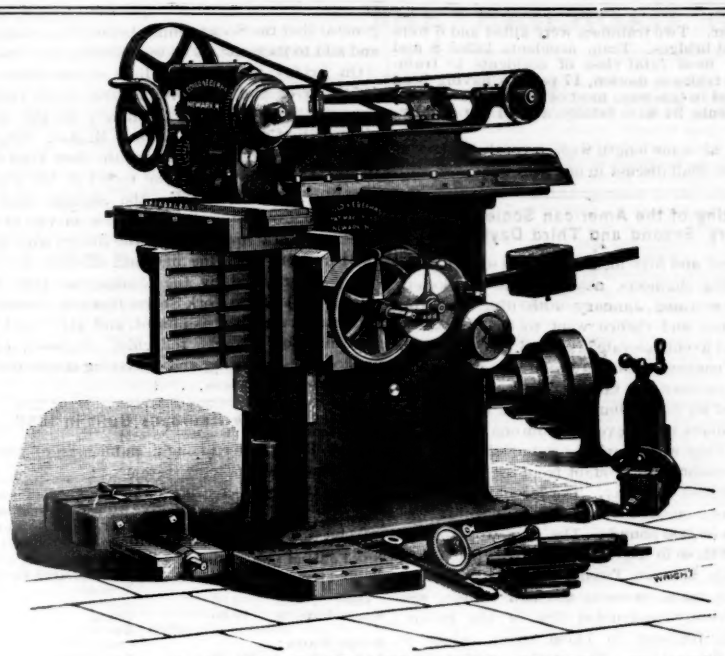
Weight in Ordinary Working Order.

	Pounds.
Truck	32,700
Main drivers	34,200
Hind drivers	34,000
Total engine	100,900
Tender, full coal and water	78,100
Total engine and tender	179.000
Capacity of tender tank	3,408 gal.
" fuel space, 5 tons, or	120 cub. ft.
Total wheel base of engine and tender	45 ft. 8½ in.
Tractive force per lb. average pressure on pistons	120.3 lbs.

Shop Notes at Columbus.

The new shops of the Pittsburgh, Cincinnati & St. Louis at Columbus, Ohio, are especially laid out so as to admit of future extension. The usefulness of many otherwise well arranged works has been much crippled by the fact that when originally built no provision was made for enlarging the works at any future time, and consequently any subsequent additions could not be placed in the most suitable and convenient place, but had to be built wherever there was room. The symmetry of the works is consequently greatly disturbed, and in order to handle materials economically and carry on the work with convenience and dispatch, machinery has to be shifted and shops converted to other uses. These changes, of course, involve loss of time and cost money. Where, however, shops are originally laid out with a view to future extension, it is easy to enlarge whenever it is necessary. Shops can be built with the sides and one end permanent, while the other end is temporary, and only intended to last until the shop is completed to the full size. Necessarily the large amount of space left for extension makes the shops at Columbus appear at present somewhat scattered, but they are of course no further apart now than they will be in ten or fifteen years time, when the growth of traffic will probably have rendered necessary the full extension, and the shops then being built to their full size, will cover the ground as closely as convenient.

A few years ago, no less than nine locomotive shops existed on the line, and at all these points new engines were built. The heavy machinery and tools will shortly be concentrated at shops at four points: Logansport, Indianapolis, Denison and Columbus, and all work, except very light repairs, will be effected at the shops at these points. While the first three named shops will execute the repairs of their respective divisions, the Columbus shops will build new work and also ex



RACK CUTTER ATTACHMENT FOR SHAPER.

Made by MESSRS. GOULD & EBERHARDT, *Newark, N. J.*

ecute repairs for the divisions of the road nearest Columbus. In this way, the work will be concentrated at a few points possessed of thoroughly well equipped shops and capable of turning out work to the best advantage. It is evident that divergences from standards are far less likely with a small than with a large number of shops.

The new shops are situated about one mile from the Union Depot, and are alongside the main line from Pittsburgh. The round house, coal stage, and locomotive and car repair shops are situated on the same plot of ground. None of the shops have been long completed. and the foundry and erecting-shop are not yet begun.

The shops are heated by the Sturtevant system, which is here applied for the first time to large buildings. The methods employed differ widely from those in general use, and the facility with which the heat can be regulated, and the excellent circulation of air attained, render the Sturtevant system worthy of careful investigation. The air is heated by contact with steam pipes, but these pipes are not placed round the floor of the shop as usual, but are concentrated at one spot, however large the shop, while the floor is perfectly clear and unobstructed by any pipes or ducts of any kind. The steam pipes are arranged in a sort of grating forming one end of a light wrought-iron box, which is approximately air-tight. A fan sucks air through the grating of steam pipes and drives it into a large pipe formed of light No. 22 gauge galvanised iron. This pipe is supported from the roof of the shop at a convenient distance overhead, so as to be clear of engines, cars or machines, as the case may be. Numerous branch pipes lead downward from this air main to within a distance of about 6 or 7 ft. above the floor. The ends of these pipes can be either wholly or partially closed by means of simple sliding valves formed of a sheet of galvanised iron.

The fan thus sucks the air through the nest of steam pipes and forces it through the large pipes, distributing it through the shop. The warm air being directed downward, first strikes the floor of the shop, and then circulates. If the outer doors of the shop are all closed to prevent any egress of external air, it is evident that the air in the shop must be continually drawn through the fan and thus kept continually circulating. That the circulation is considerable, may be judged from two facts. No smell of paint is perceptible in the car paint shop at Columbus, and we are informed that the shops can be comfortably warmed in half an hour. This would be impossible unless the circulation of air was so considerable that every particle of air had repeatedly passed through the fan in that time.

Most systems of heating possess one great defect. It is very difficult to regulate the temperature of the building. The system adopted at Columbus appears, however, to possess several independent methods of regulation. The speed of the fan can be varied. If run fast, a great quantity of air is passed through the grating of steam pipes, and as the same air is passed through again and again, it soon becomes well heated. Thus the fan can be run fast for some little time before the men commence work in the morning, and consequently the shop is comfortably warm when they arrive, and their tools can be handled with comfort and are not cold and clammy. The speed of the fan can then be slackened and the shop kept at an even temperature, so that the heat taken from the air inside the shop by coutact with the cold roof, walls and floor is again restored, as the air is again passed through the grating of steam pipes.

The heat can also be regulated by admitting either live or exhaust steam to the pipes or a mixture of both. By opening a door near the steam pipes the cold external air can be drawn in instead of the comparatively warm air from the shops.

The above methods of regulation apply to the whole shop, but the valves at the ends of the hot air ducts afford a means of regulating the heat in any part of the shop. If a man feels it too warm, he simply partially or entirely closes or shuts the valve near him. If, on the contrary, he is too cold, the valve can be pulled full open.

The fan can be driven by a belt when shafting is convenient, as in a machine shop. In a paint shop or a building where there is no power, a small engine is employed.

The cost of the apparatus is, we understand, considerably higher than that of ordinary apparatus, but it is, of course, a question whether the excellent circulation and easy regulation is not well worth the extra cost. The pipes being all close together and arranged in short lengths, any leakage can be easily detected, and no trouble is likely to arise from contraction and expansion.

Warm air in circulation will, of course, dry paint more quickly than stagnant air at the same temperature, and the gain in time of painting passenger cars is reckoned to be something like 10 per cent. As passenger cars occupy a good deal of shop room, this is a valuable consideration. On many roads the paint shops are so chronically overcrowded with passenger cars that it is difficult to take in cars which really need repainting. If cars can be repainted in less time the capacity of the shop is virtually increased, and in this way any system of heating which keeps the air in rapid circulation presents great advantages.

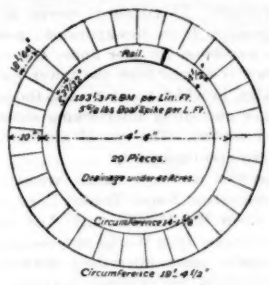


Fig. 1.

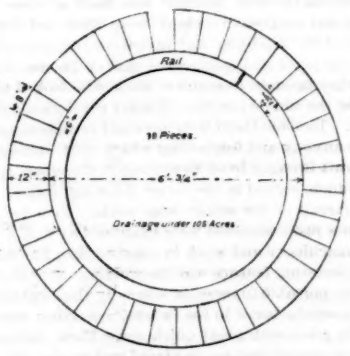


Fig. 2.

Chicago, Burlington & Quincy Timber Barrel Culverts.

Two batteries of boilers are used, one near the iron machine shop and the other near the planing mill. Each battery contains at present two boilers, but the boiler houses can be enlarged when required, one end being temporary. Each boiler is 20 ft. long and 6 ft. diameter, externally fired, with internal flues. The products of combustion are conveyed from the top of the boilers by iron downtakes to an underground flue which communicates with a self-supporting wrought iron chimney placed a short distance away from the boiler house.

The bottom sheet of each boiler is formed of one plate 112 in. wide when flat by 20 ft. long. Thus no rivets are in contact with the fire. This exceptionally large steel sheet shows the great capacity of modern rolling mills. The boilers were made in the shops at Columbus.

The steam is conveyed under ground from the boilers to the various shop engines by pipes arranged on a modification of the Holley system, which has been very successfully used underground by the New York Steam Company, and elsewhere The steam pipes are provided with expansion disks every 50 feet and are covered with an asbetos non-conducting composition. The pipes thus covered are placed in hollowed wooden logs, and the earth filled in. The pipes are well provided with traps so that all condensed water is drained off into the main drains laid for general drainage underneath the whole plot of ground occupied by the shops.

The fires in the smith's shop are arranged in groups of four, not, however, placed close together as in some shops where the fires are grouped. Each fire is provided with movable shields and with a wrought-iron smoke stack running into a larger stack, which thus serves for four fires. This method is said to cost less than that of using separate stacks for each fire.

The forges have a tuyere in the centre with two openings. The wind-chest is immediately under the tuyere, and has a door in the bottom. This door is kept closed by a weighted lever, and when opened by the smith any ashes that have got into the wind-chest can fall through. This form of forge has been in use at Columbus for some time, and gives great satisfaction, the tuyere standing well and not being liable to choke or burn.

The car repairs are made in a round-house, served by a a turn table 100 ft. in diameter. This table was tested by being loaded by two locomotives, one weighing 66,000 lbs., and the other 90,000 lbs., placed near the ends. As the table is of course not intended to turn engines, this is a very severe test. The total deflection was ⅝ in.

The head linings are stretched endways for painting by rollers, provided with a rachet and holes for capstan-bars, and transversely the frames to which the head lining is secured can be forced further apart by screws. Should the head lining become loose through change of weather, it can be stretched tight again very readily. The head linings appear to stand better in the cars and do not sag down.

Chicago, Burlington & Quincy Timber Barrel Culverts.

We illustrate this week the timber culverts used by the Chicago, Burlington & Quincy. This company, like the Chicago, Milwaukee & St. Paul, whose timber culverts we showed on page 328 of our last volume, has found it desirable, in view of the absence or poor quality of the stone along its lines, to resort to timber and iron.

The smaller culverts used are almost identical with those we have already illustrated. For the larger sizes it has been found better to use a barrel, constructed as shown by figs. 1 and 2.

These culverts have been used on all new branches built since 1878. Iron rings, made from old rails, are placed about 10 ft. apart when the culverts are built.

As soon as the timber is thoroughly seasoned the culverts are lined with a single ring of bricks and concrete or stone parapet walls are built. If, at any time, the culverts should fail an iron pipe can be put in as is done by C., M. & St. P. R. R. in their square timber culverts.

The timber costs about $12 per M. at Mississippi River, and the cost of dressing is about $1.50 per M. at the company's shops.

Rack Cutter Attachment for Shaper.

This very useful attachment is designed by Messrs. Gould & Eberhardt, of Newark, N. J., to meet a want where the purchaser does not wish to invest a large amount in one tool which could be used only for rack cutting, and would remain idle a large part of the time.

With this attachment, one of Messrs. Gould & Eberhardt's shapers can be converted at a small cost into a complete rack cutting machine.

The cutter arbor is capable of admitting two cutters, side by side, one for blocking out and one for finishing. The dividing mechanism furnished will cut either circular or diametral pitches, without changing any gears, and will divide to the $\frac{1}{10000}$ part of an inch.

The work is held in the vise or chuck, made specially for holding racks to be cut. The cutter is fed through automatically, and is run back by hand wheel. Four changes of feed are obtainable for cutting various metals. All parts are large, well proportioned and well fitted together and can be attached to four sizes of shapers, having respectively 15, 20, 25, and 30 in. stroke.

Any further information may be had by applying to the manufacturers, Gould & Eberhardt, Newark, N. J.

The Massachusetts Railroad Commission Report.

The Massachusetts Railroad Commissioners' Report for the year ending Sept. 30, 1886, differs from that of most other States in indicating an exceptionally prosperous condition of railroad business. This is partly due to the large volume of high class local freight, partly to the heavy passenger business, and most of all, perhaps, to the fact that there has been no such disastrous duplication of lines in recent years as we have witnessed elsewhere. The Massachusetts figures read more like those of a European than of a typical American railroad system.

Only eight miles of road were added in the course of the year. The returns cover 2,887 miles of road, 1,989 of which were in Massachusetts itself. Of the latter, 734, or about three-eighths, were double track. The capital stock now amounts to 130⅝ million dollars, the net debt to 71 millions. In the past year the stock has increased $2,100,000, but the debt has *decreased* $2,700,000; making a smaller aggregate capitalization than in 1885 or 1884. The average cost of standard-gauge roads is returned at $62,540.41 per mile; the cost of equipment per mile operated averages $5,947.33—

making the average cost of a standard-gauge road, with equipment, $68,487.74. The cost of narrow-gauge roads averages $31,030.80 per mile, and $5,847.57 per mile additional for equipment.

There is remarkably little water in any of these, not nearly enough to counterbalance the capital actually invested which now does not appear anywhere. The resulting capitalization is much lower than that of any European system of equal quality and efficiency. No wonder, therefore, that the rate of profit is high. The percentage of dividends to total capital stock was 5⅛; the percentage of net income to permanent investments was 6.3 per cent. deducting rents, or nearly 8 per cent. without such deduction. The gains were distributed as follows among the different companies.

12 companies with $9,205,000 permanent investment had no net income.
9 companies with $39,551,000 permanent investment had 3½ per cent. or less.
13 companies with $14,729,000 permanent investment had 3½ to 5½ per cent.
9 companies with $54,156,000 permanent investment had 5½ to 7½ per cent.
10 companies with $57,702.000 permanent investment had 7½ to 9½ per cent.
4 companies with $38,911,000 permanent investment had over 9½ per cent.
Total, 57 companies with $214,254 000 permanent investment had net income of 7.9 per cent.

The aggregate gross earnings were $49,316,000, as against $44,623,000 in the year previous, a gain of *ten and one-half* per cent. on a substantially unaltered mileage; 1885 had shown a gain of 3½ per cent. over 1884, in which year earnings were slightly lower than in 1883. The proportion between passenger and freight earnings for successive years is instructive as showing the great importance of the passenger business in Massachusetts railroad economy, and the superior steadiness of its growth.

Years.	Passenger earnings.	Freight earnings.
1881-82	19,567,274.71	19,527,004.54
1882-83	20 602.289 13	21,013,511.26
1883-84	21,207,200.42	20.249,776.88
1884-85	21,549.369.27	20,192,971.72
1885-86	23,331,325.71	22,840 383.53
Years.	**Total passenger mileage.**	**Total freight mileage.**
1881-82	892 321.207	1,130,070.652
1882-83	943,245,658	1,220.8.4.418
1883-84	1,007,138,376	1,229.368,472
1884-85	1,041,628,073	1,260,160,455
1885-86	1,124,148,045	1,391,026,438

Operating expenses have increased during the past year quite as fast as earnings—the charges for repairs having decidedly increased, as is almost always the case in prosperous years. They formed 63 per cent. of the gross income, against 62 per cent. in 1885. The earnings per mile in 1886 were $12,221; the expenses per mile $8,148.

The expenses per train mile for successive years have been as follows:

1878-79	$0.845	1882-83	$0 949
1879-80	.902	1883-84	.895
1880-81	.810	1884-85	.813
1881-82	.863	1885-86	.845

While the expense per train mile was exactly the same in 1886 as in 1879, it will be found that the average passenger train load had increased from 57 to 66, and the average weight of paying freight from 89 to 113 tons.

Some of the more important items of expense were as follows:

	1884.	1885.	1886.
Repairs of road-bed	$0.122	$0.118	$0 142
" bridges	0.024	0.023	0 025
" rails	0.021	0.015	0.015
" locomotives	0.060	0.054	0 056
" passenger cars	0.039	0.035	0.039
" freight cars	0.043	0.035	0.047
Wages	0.283	0 268	0.272
Oil and waste	0.010	0 008	0.007
Fuel	0.111	0.094	0.091
Totals	$0.713	$0.650	$0 674

The expenses per train-mile were lowest on the Boston & Lowell ($0.680) and highest on the Boston & Providence ($1.216).

The average fare per passenger-mile on all roads is only 1.88 cents. On the other hand the average charge per ton mile is nearly 1⅝ cents. An interesting table shows the reductions in freight charge on different roads.

AVERAGE RATES OF FREIGHT, 1865 AND 1886.

	Rate 1865. Cents.	Rate 1886. Cents.	Per cent. of 1865 to 1886.
Boston & Albany	3.90	1.10	28
Boston & Maine	4.58	2.27	49
Boston & Providence	4.38	2.84	65
Connecticut River	6 20	2 81	45
Fitchburg	4.10	1.07	26
Old Colony	3.20	2.93	92

The total number of employés is 31,188; an increase of 1,119 over 1885, which had shown a slight reduction in force as compared with 1884.

The returns of accidents are not fully tabulated in that part of the report which is included in the advance sheets. The Bardwell's Ferry accident on the State road made the record for the year a bad one—worse than any since the Wollaston disaster in 1878, though by no means as bad as that. In the absence of tables, we quote the more important paragraphs of the summary given in the report.

"The whole number of accidents reported to the Board during the year was 525, being 25 more than for the preceding year. The number of casualties to persons was 591, being 74 more than last year. Of these, 203 were killed and 388 were injured; 114 were passengers, 274 were employés, 44 were travelers at grade crossings and 159 were trespassers. The casualties to passengers were 40 more than during the preceding year; and of these 9 were killed and 43 were injured by causes beyond their own control, while last year no passenger was killed and but 12 were injured by such causes. The number injured by their own misconduct or imprudence was 10 fatally and 52 not fatally. Last year, 14 were killed and 48 were injured by their own fault.

"Of the 274 casualties to employés, 63 were fatal and 211 not fatal; 213 were trainmen and 61 were employed in other capacities. By coupling or uncoupling cars, two were killed and 105 were injured. Only one accident is reported as occurring where an automatic coupler was used. In that case a damaged United States coupler connected with an ordinary link and pin drawbar. Two trainmen were killed and 6 were injured by overhead bridges. Train accidents killed 8 and injured 18. The most fatal class of accidents to trainmen is falling from trains in motion, 17 persons having been killed and 38 injured in this way, most of them severely. By various other accidents, 34 were fatally, and 144 not fatally, injured."

The report deals at some length with several matters of legislation, which we shall discuss in our next issue.

The Annual Meeting of the American Society of Civil Engineers—Second and Third Days.

About one hundred and fifty members of the society, with a number of visiting engineers, assembled at the Society House on Thursday morning, January 20th (the day after the Annual Meeting), and thence went to the 23d street station of the Second avenue elevated railroad. After a short wait here for the convenience of any belated individuals, a special train bound up town was taken. The locomotive and cars of this train had an unfamiliar appearance even to the old New York members who travel daily on one or other of the elevated lines. They were marked "Suburban," and had for this special occasion been brought from the lines of the Suburban Rapid Transit Railway. The locomotive seemed heavier than those used on the City Elevated lines. It was understood to weigh 58,000 pounds. The cars were of the same general plan of those in use on the Elevated Roads.

No stops were made between Twenty-third street and the Harlem River. The train, crossing the new bridge, was drawn over the recently constructed line of the Suburban Rapid Transit Railway to 147th street, which is the terminus of the finished line. The station at that point is very commodious. Here an opportunity was given for an examination of the method of construction of this road, which differs from the elevated lines in the city in several respects. The road is built through the centre of blocks and not on the line of an avenue or street. The plate girder superstructure is supported on brick piers and arches and not on iron columns. Discussion as to the relative merits of the two methods was quite earnest and quite too extended to report here. At 147th street the road divides, one branch going toward the city limits in a northwesterly and another branch in a northeasterly direction, while still another is ultimately to be built between the two. Work of construction is actively in progress. Mr. Samuel R. Filley, the President, Mr. J. J. R. Croes, M. Am. Soc. C. E., the Chief Engineer, and Mr. Wetmore, the Superintendent of the Suburban Rapid Transit road, escorted the party and answered, as far as three men could, the continuous questions of these inquisitive engineers.

Returning to the Harlem River the new railway drawbridge was inspected and the successful and interesting machinery by which the draw is manipulated was explained by Mr. Theodore Cooper, M. Am. So. C. E., who designed the structure. This draw is moved by a continuous wire rope passing from the hydraulic power, to and around the live wheels on the pier under the centre of the bridge. The draw is moved from the tower room over the centre of the bridge, in which room are also the levers which control the danger and safety interlocking signals, the system being very complete. The special appliances for locking the draw were also explained.

After an inspection of the terminal arrangements connected with the Suburban Rapid Transit Road, a steamboat took the party down the Harlem and East rivers to the wharf of the Continental Iron Works at Greenpoint. In the offices of those works many interesting drawings were exhibited, and among them the original drawings of the first Monitor, made by John Ericsson, Hon. M. Am. Soc. C. E., and from which the first Monitor was built at these works. Interesting and suggestive indeed were these old drawings. They recalled the ingenuity and inventive resources of John Ericsson, the pluck and mechanical skill of Thomas F. Rowland, and they brought to many of those who looked at them memories of the time when that Monitor revolutionized naval operations. To some there were personal recollections of the relief from anxiety and foreboding which that strange-looking little craft brought to so many twenty-five years ago.

After a lunch, served in the large drawing rooms of the office, the circuit of the works was made. Two handsome beam engines just completed were examined as well as various other machinery and work in construction, but the particularly interesting feature was the welding of iron by the use of double portable tuyeres, in which by the combustion of water gas (manufactured in the works) a welding heat was developed in place with great quickness. These tuyeres are on arms so arranged that one is placed under and the other above the area to be welded. Long cylinders are thus speedily welded and the heads of cylinders welded to the bodies with great rapidity and effectiveness.

The absence on account of temporary ill health of Mr. Thomas F. Rowland, just re-elected Vice-President of the society, and the proprietor of these works, was greatly regretted, but his representatives, Messrs. Warren E. Hill, Dr. Lucius A. Smith, and the younger Messrs. Rowland, together with the other members of the staff of these works, gave to the visiting engineers very full and interesting information during the inspection of the shops.

The steamer then took the party to Bedloe's Island, where, under the escort of Captain Fessenden, U. S. A., the statue of Liberty was visited. The curiosity and energy of engineers were well exhibited here. Not only the younger members of the party, but very many of the older ones, climbed those interminable steps and ladders, and are now able to say that they have stood upon the outstretched hand of Liberty enlightening the world.

On Thursday evening the usual reception was held at the Society House, and was so well attended that the feeling was general that the Society must before long enlarge its rooms and add to its house, as its membership increases.

On Friday morning the lines of the cable railways in 125th street and in Tenth avenue were visited, and the powerful and ingenious machinery at the depot was explained by Col. Wm. H. Paine, M. Am. Soc. C. E., the engineer in charge. Afterward the New York and Brooklyn Bridge was visited under the escort of Mr. Charles C. Martin, M. Am. Soc. C. E., the engineer and superintendent. The Cold Storage Warehouse in one of the vaults of the New York approach to the Bridge was also inspected, and here were seen the new and effective ice machines recently constructed by the Continental Iron Works. The station of the New York Steam Heating Company in Greenwich street was then examined, and Mr. Charles E. Emery, M. Am. Soc. C. E., the chief engineer, explained the methods of generating and delivering steam at working pressures at long distances.

New Railroads Built in 1886.

Messrs. Poor & Greenough, publishers of *Poor's Manual*, have issued the following statement:

From the reports received at the office of our *Manual of Railroads*, we are able to give an accurate summary of the construction during the past year. The total mileage built in 1886 was 8,648 miles, distributed as follows:

	Miles.		Miles.
New England:		Southwestern Group:	
Maine	16.00	Missouri	90.81
New Hampshire	6.00	Arkansas	22.00
Massachusetts	19.00	Texas	625.90
	41.00	Kansas	1,568.40
Middle States:		Colorado	72.00
New York	101.26	New Mexico	38.00
New Jersey	42.00	Indian Ter.	10.00
Pennsylvania	177.72		2,427.11
Maryland	53.50	Northwestern Group:	
	374.48	Iowa	379.68
Central Northern Group:		Minnesota	497.22
Ohio	108.70	Nebraska	738.90
Michigan	269.73	Dakota	826.48
Indiana	115.32	Wyoming	117 90
Illinois	368.50	Montana	18.00
Wisconsin	369.36		2,578 18
	1.231 61	Pacific Group:	
South Atlantic Group:		Wash. Ter.	209 23
Virginia	40.50	Oregon	48.50
West Virginia	116.50	California	267.75
North Carolina	167 00	Arizona	99.00
South Carolina	132.00	Idaho Ter.	13 50
Georgia	242.13		637.95
Florida	320.80		
	1.018.93	Total for the U. S.	8,648.76
Mississippi Valley Group:			
Alabama	62.50		
Mississippi	174.00		
Tennessee	25.00		
Kentucky	68.50		
Louisiana	9.50		
	339.50		

This makes the total mileage in the United States at the close of the year 137,615 miles. The reports received from the various railroad companies of work which is in progress or under contemplation indicate that construction during the year 1887 will amount to not less than 12,000 miles, unless some serious convulsion should occur to reverse plans which are now entertained.

This estimate is confirmed by engagements which have been made in advance for the current year with rail mills and other manufacturers of railroad plant.

As the prominent element of railroad construction throughout its various steps is payment for labor, it is sufficiently evident what an important item of employment for the working classes seems already assured for 1887, since it is probable that the cost of the above work will exceed $200,000,000.

Train Lighting by Electricity.

Three main systems of lighting trains by electricity have been tried during the last two years. In one system several secondary or storage batteries are placed in the train and the light distributed from them. Another system is that of primary batteries, of which we have heard little of late. Another method of electrically lighting a train is to run the lights direct from the dynamo, the motive power being furnished by the locomotive or to a separate engine fed from the locomotive boiler. This is unsatisfactory. The light cannot be supplied to the train unless when the engine is attached to the carriages, and as this rarely happens until a few moments before the actual starting of a train from the terminus, the carriages are consequently left in darkness at a time when they require light most. The supply is irregular, and the wages for a separate attendant render the plan too costly. A system has been tried in which a separate engine and boiler were used, but we are not aware that any practical progress has been made in this direction. The system of train-lighting by electricity by means of accumulators has been in use on the Pullman train running on the Brighton Railway for the past five years. It has, however, been found to be slow, inconvenient and expensive. In the first place, a steam engine is required for the dynamo to charge the cells. Next, there is the rent of premises and the wages of an attendant. Then there is the cost of carrying to and from the train the cells when charged and discharged, and the injury occasioned to them therefrom, for while the oscillation of the train does not affect the cells prejudicially, repeatedly shifting the position of cells is most undesirable.

Mr. Stroudley, the Locomotive Superintendent of the Brighton Railway, saw that both the accumulator and the direct dynamo system possessed advantages which, if the two systems could be blended might produce satisfactory results. In conjunction, therefore, with Mr. Houghton, Mr. Stroudley has devised and perfected such a combined system, and it has been carefully and successfully tried on the Brighton line. This system comprises the utilization of power from the axle of the engine by an arrangement of belting and shafting on to the spindle of the dynamo. The working apparatus consists of a dynamo machine of the neccessary electro-motive force and an accumulator of sufficient power to absorb the output of the dynamo when no light is required, and to add to such output the requisite supply of current when the whole of the lamps are on. Beyond this and most important of all, there is a device which automatically excites the field magnets of the dynamo prior to the closing of the circuit, shuts it out of the circuit until the speed of the train is such as to create an E. M. F. in the dynamo sufficient to charge the cells, or when the speed is so reduced that the E. M. F. of the dynamo is less than that of the cells, then to cut the dynamo out of the circuit, as otherwise the cells would play back on to the dynamo. The apparatus also prevents any excess of current being generated in the dynamo when the train is running at an abnormally great speed. The accumulator or store being always kept full or well filled, a light can therefore be obtained while the dynamo is not at work, and without the necessity of the en-

gine being attached to the train. The only attention that is required is at the terminus, when the brushes of the dynamo have to be looked at to see that they have preserved their proper angle. During the daytime, when the light is only needed when passing through a tunnel, the guard can, by turning the handle or lever of a simple switch, put the light on, and by reversing the lever it can be shut off. At night, when a constant light is wanted, the switch is kept on continuously, and the accumulator and dynamo working in conjunction supply the current. Another important feature of the apparatus is that it is automatically reversible, and consequently works no matter in which direction the train is going.

The installation itself comprises a specially modified form of the Brush dynamo, a storage battery consisting of twenty of the Electrical Power Storage Company's cells, and the automatic apparatus, the whole being fitted in a portion of the guard's brake van. The connections between the carriages are so constructed that they can easily be uncoupled, and in slip carriages will be so automatically. Two trains on the Brighton line have been fitted up on this system, a local and an express train. The local train commenced running on Nov. 29, 1883, and has worked without cessation ever since. During the foggy weather the light was often burning from two or three o'clock in the afternoon until midnight, and we are informed that there has never been a failure at any time. The express train, which has been newly fitted up, has been so arranged that there are two lights to each compartment, to prevent the possibility of a compartment being left in the dark owing to the breakage of a lamp. The present lamp glasses and holes in the roof of the carriage are also utilized, and the electric lamps may be removed and replaced by a man on the roof quite readily. Altogether the plan appears to be a success, and to present the best solution to the question of train-lighting by electricity that has yet been advanced.—*Iron.*

Early American Inquiry into the Value of Railroads.

In the article by Mr. J. E. Watkins on the "Semi-Centennial of the Pennsylvania Railroad," published in our issue of April 11, 1886, reference was made to the "Pennsylvania Society for the Promotion of Internal Improvement," and the part which it took in introducing railroads, especially by engaging an engineer, Mr. William Strickland, to visit England and study the railroads there, which he did three years before Mr. Horatio Allen gave the first American order for locomotives there. Mr. Watkins has discovered and furnished us with the following interesting correspondence between this society and Mr. Strickland:

Extract of a letter addressed to William Strickland, Esq., on Sept. 19, 1825:

"*Canals* and *railways* present the most important of all subjects for your attention. Upon every matter connected with both, you will be expected to be well informed, and if you shall have to decide between them, you must be able to furnish the facts and circumstances by which the decision shall be produced. Much excitement prevails in this state upon the question whether railways are superior to canals, and the inquiries which are in progress in relation to them, are in the hands of men of ingenuity and well disposed to the cause of internal improvement. It is, however, feared by many that the question between canals and railways will have an injurious influence in Pennsylvania, as it will divide the friends of the cause of improvement, and thus postpone, if not prevent, the commencement of the work. The importance of correct information in relation to them is thus greatly increased.

"Those who have not had the same opportunities of testing the advantages of the mode of transportation which you now prefer, will pause, unless you furnish facts and arguments of an entirely conclusive character.

"Do you contemplate confining railways to the transportation of goods and merchandise, or do you propose they shall also be employed for the carriage of passengers? If both, must there not be not only a double railway for the merchandise, but also a double railway for passengers? If these are to be formed, will not the expense of a railway be very considerable, say, if iron is at £14 per ton—not less than £8,000 sterling per mile. Ought wood to be used as the foundation for the rails, thereby reducing the size of the rails, as has been suggested by some persons?

"Do you contemplate the use of locomotive engines on railways in Pennsylvania?

"Have you considered the difficulties and obstructions which the necessity to use [stationary] steam engines to overcome ascents will produce; as these machines will require engineers and skill to use them, and to repair them; and many of them must be located in the midst of mountains, far from settlements, and equally distant from the habitations of those who are competent to repair them?

"The present establishments in the United States for the making of iron find a market for all the iron they make, at high prices. Pig iron at Pittsburgh is $40 per ton. Bar iron, $125 per ton. Would not the demand for iron for a railway from Philadelphia to Pittsburgh increase the price, and could that demand be supplied within a reasonable time?

"These propositions are not suggested as insurmountable difficulties, but as specimens of the matters which will be inquired of you when you return. It is not for the Pennsylvania Society to adopt a preference for any particular plan of improvement or to discourage investigation. Its object is the improvement of the state by the best plan; and, this accomplished, the members will be fully compensated for their contributions towards the same."

Mr. Strickland answered as follows:

To the Pennsylvania Society for the Promotion of Internal Improvement in the Commonwealth:

GENTLEMEN: The queries proposed to me by the Acting Committee, respecting railroads, contained in a letter of the Corresponding Secretary, dated Sept. 19, 1825, have been duly considered by me, and, although I am urged to furnish facts and arguments respecting them of an entirely conclusive character, I must be excused from any intention to offer opinions which may have a tendency to excite or divert the public from improving the state upon the most judicious plan. I am assured it is not the object of the society to give a preference to any particular plan of improvement, or to discourage investigation.

If an extensive railway should be proposed in Pennsylvania, it ought to be *a double line of edge-rail* and calculated for the use of locomotive engines: for with *them only* as the moving power consists any decided advantage over other modes of conveyance. I would form this double line of railroad at least 10 ft. apart, making it as nearly *level* as possible, or at any rate not to exceed $\frac{1}{10}$ of an inch rise in the yard. It should be constructed for the transportation of goods, merchandise and lumber of all kinds.

If the country through which road has to pass be undulating or hilly I would seek a level, to its greatest extent, by *winding round the hills, cutting through them or tunneling*, whichever might prove, from accurate survey, to be the best and most expedient; I would avoid the frequent construction of *inclined planes* with fixed engines and carry the *level* or slightly inclined road as far as possible in *successive platforms* or *level stages* without assuming a higher level, until it became necessary to overcome a lift of not less than 50 ft. at once. This would, of course, depend upon the nature of the ground upon which a second *extensive level* could be established; and so on, carefully avoiding all *small lifts* by inclined planes. I must here be permitted to remark that this plan does not differ much from that pursued in the location of a canal; and that it will be admitted to be evidently cheaper to cut through a hill or for a tunnel from the passage of a railroad than for that of a canal; and again there is no country, however its surface may be varied, but what will afford as many facilities for the execution of the one as the other. If therefore a succession of level platforms, or stages of railroad, be established, and locomotive engines are made to ply upon each stage, it may be practically proved that there can be no greater difficulty in producing a transit of the *same quantity of goods or merchandise*, at the rate of *six miles* an hour, than is usually conveyed upon a canal at one-third that speed. It is mainly from the application of *steam to machinery as the motive power* that a decided advantage is to be gained in the transportation of goods upon railroads; and if *speed* is at all desirable, then they are the best means by which it can be certainly and most economically obtained. That practical efficiency of the locomotive engine, and its superiority over horses working upon canals, was fully proved by the evidence adduced before the committee of the House of Commons on the Liverpool & Manchester Railway bill. The stationary engine and inclined plane afford equally as speedy and *simple* a mode of communication between two level stages, and may be constructed with a lift of 50 ft. in a thousand feet, for half the sum required to overcome the same elevation by lockage. Engines require, perhaps, more skill in *attendance and repairs* than locks; and this may be urged as an argument against their use, "in the midst of the mountains of Pennsylvania, far from the settlements and habitations of persons who may be competent to repair them;" to this objection, I will only add that the management and repairs of locks and their sluices in the same situation would be attended with nearly the same difficulties; but I take it for granted that there must be an attendant to either species of machinery who properly understands the subject.

The extra power of the stationary steam engine may be employed for manufacturing purposes, such as grinding grain, sawing timber, etc., etc. *If wood* be used as the foundation for rails, its *depth*, in order to afford sufficient strength for the support of a great weight, would be calculated to elevate the rails too high above the surface of the road to allow a sufficient discharge of the rain water under them; if the rails be reduced in size and inserted in the wood, or bolted to it, it would be impracticable to give them an equal and uniform bearing throughout their *whole length*, and they would from this cause inevitably break; it is most essential that the *ends only* of the rail *should bear*, and hence a proportionate weight and strength of metal should be given to the intermediate parts.

I have no doubt but a demand for iron sufficient to form a railway from Philadelphia to Pittsburgh would increase its price considerably in Pennsylvania; and that there would be a great disadvantage experienced from the impossibility of the state being able to supply that demand within a reasonable period of time.

Various propositions may be suggested as *untried* and insurmountable *difficulties*, in the management and conduct of railroads, because they have never yet been used as a means of general or distant intercommunication; these are only to be understood by the fact that they have been satisfactorily proved, upon a *small scale*, comparatively speaking; but they have been practically applied to various surfaces of country, and there now appears in England to be a strong confidence, among men of intelligence and capital, that there is in this country a necessity for a *general extension* of their advantages to facilitate the operations of *trade and commerce*.

It will be admitted, however, that there are situations where canals cannot be formed; and where, if formed, they may be ruinous and abortive experiments; but these can rarely occur with railways properly constructed; a railway will always be *at least a road*.

In making the foregoing observations, I do not wish to be understood as the champion of this species of conveyance, in opposition to the known advantages of canals, but simply as expressing, in common with others, an honest opinion derived from a personal investigation of *facts*, which may be presumed to have been exhibited, *perhaps* upon too *small a scale* in England to admit of an unequivocal recommendation to your Society, or the people of Pennsylvania, as the subject of *preference or experiment*.

I inclose you the report of the committee of the Birmingham & Liverpool Railway Co., in which you will perceive the causes which have produced a delay in the execution of *their work*, and the confidence they still maintain of its high national importance.

Respectfully submitted by your obedient servant,

WILLIAM STRICKLAND, Engineer.

LIVERPOOL, Oct. 20, 1825.

Experiments on Effect of Rail Joints on Bridge Strains.

M. Considère, a Chief Engineer of the French Department of Roads and Bridges, published last year in the "Annales des Ponts et Chaussees" and the "Revue Générale des Chemins de Fer" an interesting series of articles on the effects of rail joints in bridges on the strains in the structures. These show, as might be expected, a very serious influence on the fatigue of bridges exercised by the position and condition of the joints.

The author's deductions are as follows:

The evil effects are about proportional to the speed of trains.

The increase of strain is very slight where splices are tight, but increase rapidly as a suspended joint becomes flexible.

The *increase of strain does not take place to any considerable amount in a supported joint*, whether well or loosely spliced.

The shocks arise entirely from the weight of the wheels themselves, and are not affected by weight carried on springs.

In a railroad bridge, the increase of any mass interposed between the rail and the truss has the effect of increasing or diminishing the shock on the truss according as the interposed mass is more or less rigid than the truss itself; for instance, if we place a heavy wooden floor on an iron truss bridge, we decrease the shocks it experiences from trains, whereas an iron floor on a wooden truss would have the contrary effect. The author supports the results of his reasoning, and of his observation on actual bridges, by a simple but effective little experiment developing fully the principle involved.

He suspends a weight of say one pound to a fixed point by a slender rigid wire. To the bottom of the weight he suspends by a spiral spring a piece of wire of the same size and material as the one above the weights. A slider weighing a pound is run on this wire and arrested by a stop at the bottom. A certain number of the drops of the slider will elongate and break the wire above the weight without affecting the lower wire in any way.

The strain produced by the shocks on rail joints are proportional to the square root of the mass of the wheel and the weight carried by it without springs.

The author observes that his conclusions in favor of supported joints for bridges will seem at first contradictory to the generally admitted superiority of suspended joints on ballast, but that there is in reality no such contradiction, since the difficulty of keeping the joint tie in good order does not exist on bridges.

M. Considère, in concluding, points out the objections to rivets as parts not well adapted to bear shocks, and advises the use of the following constructions in the order of preference named: I beams; plate girders; lattice girders (excluding the latter from floor construction).

The suitability of pin construction to avoid the effect of shocks he does not mention.

The increase of shock due to the action of the reciprocating parts (whether counterbalanced and how is not stated!) is very small, only amounting to 2½ per cent. at most, of the total shock experienced.

He found that with a good steel rail, with a well made steel splice (whether plain or angle is not stated), the shock due to the joint was almost absolutely eliminated by careful screwing up of the bolts; but that on the other hand with old iron splices, the shock when the bolts were tight was only reduced by one-half to three-fifths from the shock produced with a loosely bolted joint.

In the experiments made by M. Considère on the effects of rail-joint shocks, the resulting strains in lattice members and the deflections under transverse load were ascertained by observing the depth to which a steel point was forced into a lead plate, with which it was brought into contact at the beginning of the experiment. In getting deflections this was taken directly, and in case of strains in trusses, the penetration of the point was used as a measure of the elongation of the member, the lead plate being connected to one end of the member, and the steel point to the other by a rigid separate connection.

Another series of experiments was tried upon joint deflection to ascertain the relative value of iron and steel, and of bar and angle joints when new and after carrying 80,000 trains.

The rails used were double headed rails weighing 72 lbs. per yard with a splicing angle of 32°. The splices used were 3.3 inches wide and ⅞ inch thick, capable when of iron of a strain moment of 60,690 to 69,360 inch-pounds and in steel a moment of 86,700 inch-pounds.

The method of testing was to place the two rails to be tested with the ends together on supports at the usual distance of the joint ties apart 23½ in. The joint was then spliced and loaded to give a strain moment of 42,049.5 inch-pounds, then under the same static strain, four blows of a 9 pound hammer were delivered on the joint, than the load moment was increased to 86,700 inch-pounds, 4 blows more were given and then the load moment was eased to 42,049.5 again. After each operation on the joint the deflection was taken.

The results showed, of course, a progressive increase of deflection as the strain was increased in all cases.

18 experiments were made on 7 different classes of joints as follows:

No. 1. New steel rails with new steel splices in normal position.
No. 2. Old " " " " " "
No. 3. " " " " rails reversed,
No. 4. Steel rails with new iron splices in normal position.
No. 5. Old steel rails with old iron splices in normal position.
No. 6. " " " " } rails normal. } splices reversed.
No. 7. " " " " rails and splice reversed.

The results showed a tolerably uniform proportional increase of deflection for new rails, whether of iron or steel, from the application of the first load up to the last deflection under the same load, amounting to 2½ times the first deflection.

The reversed splices, on the other hand, while showing much less deflection under the first application of the load, increased their final deflection under the same load to four times the first deflection.

The final deflection with the reversed splices still remained less than with the splice in its normal position.

M. Considère points out that the cause of this lies in the fact that the rails and splices in the reversed position hold up the joint more than do the new rails, owing to the set they have taken while in normal position; and the strains applied in the experiments did not entirely counterbalance this advantage. Probably another series of strains on the reversed and on the normal rails would have shown a worse condition of the reversed rail than its normally placed brother, owing to the greater disintegrating effect of the reversal in the direction of the strains.

M. Considère has also experimented on the effect of a change of the splice angle on the under side of the rail head. He found a reduction of one-half both in the deflection under load and in permanent set by increasing the splice angle from 82° to 127°, and he recommends an increase to 110° at any rate. Exactly what is meant by the splice angle in this case does not appear.

The experiments classified above indicated but little fatigue of the iron after use by 80,000 trains, the deflections of old splices averaging only 12 per cent. more than those of new ones.

Mr. Considère speaks decidedly in favor of steel splices, both on account of their greater resistance to horizontal

deformation by the wedging action of the rail head, and of their smaller wear at the bearing points.

His results emphasize the view that the splice bar while reasonably good in form for stiffening the joint, is weak in the matter of a suitable bearing area between the head and splice-bar.

He states that steel rails with iron splices do not wear appreciably by contact with the latter, but he does not let us know what the effect is upon the latter, which we know from other observations to be very bad.

M. Considère mentions among the consequences to be deduced from his experiments the following:

The Vignolles or T-rail resting upon longitudinal rail stringers causes much less shock to the bridge when in imperfect order than the double-headed rail in chairs.

The interposition of ballast between the rail and the bridge-girders has no material effect in diminishing shocks.

The less elastic the parts supporting the rail the more violent the shocks to the girders. Hence, rails should always be carried with the interposition of floor beams and preferably of stringers also, and not directly on the chord.

Sir Joseph Whitworth.

Sir Joseph Whitworth, one of the most distinguished and widely known mechanical engineers of our times, died at Mentone on the 22d inst., aged 84.

He embarked at an early age in the business of machine tool making in Manchester, England, and was soon distinguished for his efforts to obtain the utmost possible accuracy. One of his first steps in this direction was the introduction in 1840 of surface plates instead of grinding for the production of true plane surfaces. The practice of making three surface plates at a time, each scraped so as to touch the two other plates at all points, originated with Sir Joseph Whitworth, and is still recognized as the only method by which an accurately true flat surface can be produced.

He became largely engaged in the manufacture of the highest class of machine tools, and devoted great attention to making accurate lead-screws for lathes, etc., and the consequent construction of accurately divided scales and measuring instruments. He exhibited at the first international exhibition, held in London in 1851, a machine capable of measuring within one-millionth of an inch a bar not exceeding 40 in. in length. This machine excited considerable attention at the time, and its construction is based on the principle that for this purpose the sense of touch is much more reliable than the sense of sight, and that minute distances can be enlarged with greater accuracy by mechanical than by optical means. The correctness of this principle has been denied by recent investigators in this country.

Sir Joseph Whitworth was the first to inaugurate a system of standard screw threads. The form of thread, and the number of threads per inch which he recommended, were based partly on the results of numerous experiments and partly on the average obtained by comparing the various forms of screwed bolts then in use. The Whitworth system has been very generally adopted in all parts of the civilized world except the United States. The Sellers system, introduced here in 1864, has the same number of threads per inch, but the form of the thread is different.

In 1855 Sir Joseph, then Mr. Whitworth, turned his attention to improvements in guns and rifles and patented his well-known hexagonal bore, and showed by a series of careful experiments that rifled shot should bear a certain proportion of length to diameter in order to secure accurate shooting. These guns, though never adopted by the British Government, have been much used in South America and elsewhere.

In 1868 he founded the Whitworth scholarships, which were designed to assist young men who were studying to become competent mechanical engineers. This endowment has hardly realized expectations, but has undoubtedly brought to the front many talented young men, both from the college and the workshop.

In 1873 Sir Joseph Whitworth, after several years' experiments, perfected his system of casting steel under compression. He thus succeeded in producing the strongest known material, "Whitworth steel," which is extensively used for marine engine crank shafts, screw propellers, and other parts exposed to severe strains, where it is desired to obtain the greatest possible strength with the least possible weight without regard to cost.

The demand for Whitworth steel was so great that, in 1875, he left his old works in the centre of Manchester and moved to the outskirts, where he erected very extensive shops, equipped with the most improved forms of accurate machine tools, hydraulic cranes, forging machines, etc., etc.

About 1872 he turned his business over to a limited liability company, in which he retained a controlling interest, the remaining shares being held by his foremen and workmen. This application of the co-operative principle proved very successful, and his workmen attached considerable value both to their shares and to the voice which they had in the management of the works.

Sir Joseph distinguished himself in nearly everything which he undertook, but his name will be chiefly remembered in connection with the three great achievements of his life: The introduction of the surface plate, the Whitworth system of screw threads and Whitworth compressed steel. The machine tools which bear his name will be found in every good machine shop, and are distinguished for the accuracy of their workmanship and the neatness of their design. His taps and dies are possibly even more widely known, and are distinguished both for their excellent temper and neat and accurate finish.

Sir Joseph Whitworth leaves no son, and indeed we believe no near relative. His title consequently expires with him. His great wealth will therefore in all probability be found to have been bequeathed to educational and charitable endowments.

Automatic Couplers for Freight Cars.

A meeting of the Master Car-Builders' Club was held at their rooms, 113 Liberty street, New York, on the evening of the 20th inst. The attendance was large, but few master car-builders took part in the discussion, which decidedly lacked animation.

The President, Mr. C. E. GAREY, took the chair, and announced that the subject for discussion was "Automatic Couplers for Freight Cars." Attention was specially directed to the relative merits of two types of couplers, vertical plane and link and pin. The President also asked for a statement from the members on the vexed question, whether a locomotive could start more cars with loose than with tight couplings.

Some letters in favor of loose coupling were then read from from Mr. J. I. Kinsey (Lehigh Valley) and others.

Mr. ODYKE (New Haven & Northampton) stated that his road had made some experiments on the merits of the different couplers, but that no conclusive results had yet been obtained. He considered that heavy freight trains could be started more readily with tight than with slack couplings.

Mr. HIEN strongly indorsed this statement, and pointed out that any required amount of slack can be put into the draw-spring by increasing its range. One railroad company is now about to increase the range of their draw springs to 3 in. Slack is then obtained without any concussions, the blows being cushioned by the springs. The question as to the relative starting power of engines with slack and tight-coupled trains could be tested in 30 minutes at a nominal cost by dropping wedges between ordinary draw heads and thus taking out the slack. If any gentleman present would try this experiment he would find that the shocks in working continuous brakes were lessened 80 per cent., and that about one more car could be started. The tests made during the freight brake trials at Burlington last summer clearly showed these facts. These trials were very carefully conducted, and were not made in the interests of couplers and were, therefore, thoroughly trustworthy. These trials, as reported in the *Railroad Gazette**, showed that an engine has less momentum after one revolution than at starting, and that with either tight or loose couplers, an engine is most liable to stall when she has moved about two car lengths, contrary to the too general idea that the instant of starting is the critical time.

Though the capacity of freight cars had been largely increased, no increase had been made in the size, weight or strength of the common draw-head, link, and pin. This was caused by the fact that any such increase was impossible. It was obviously no use to strengthen the draw-head unless a corresponding increase was made in the size of the link and pin. But if these parts were strengthened, it would soon be found that the improved links and pins would be lost, and common links and pins substituted while on a foreign road. They would of course bend and break as before. The number of cases where trains broke in two was much larger than many people imagined. On one road no less than 113 trains broke in two in one month in 1886.

Mr. T. L. MCKEEN believed that actual experiments would demonstrate the relative merits of slack and tight couplers better than any verbal arguments. He understood, however, that the experiments at Burlington referred to by Mr. Hien took place on a straight and nearly level piece of track. In the part of the world where the speaker lived they had no prairies to speak of, and grades and curves were quite a feature in the landscape. He doubted whether it would be possible to handle the traffic of such a road as the Lehigh Valley with close couplers. He had, therefore, obtained the permission of Mr. H. Stanley Goodwin, the Superintendent, to make a competitive test on the Lehigh Valley between the McKeen and any vertical plane couplers, in order to test the question and ascertain whether a locomotive could start as heavy a train on grades and curves with tight as with loose couplers. The details and date of the test were not yet settled, but would be announced in due course. He, however, suggested that the loser in the trial should contribute a sum of money to St. Luke's Hospital, an institution for the benefit of Lehigh Valley employés.

Mr. J. A. SHINN asked some questions as to the couplers employed in the Burlington trials and the experiments made with regard to slack.

Mr. D. H. NEALE stated that the exact figures on this point would be found in the *Railroad Gazette*.†

The PRESIDENT in closing the discussion urged the interest and importance of the subject and the advisability of taking immediate steps, even if the perfect coupler is not yet invented. He anticipated that shortly cars with old couplers will not be allowed on through routes or be permitted to run on lines where improved devices were adopted. The great desideratum was a coupler that would couple safely and automatically to other couplers.

The subject for discussion at the next meeting, Feb. 17, will be "The Heating and Lighting of Passenger Cars." The proposed change of title and reorganization of the club will also be discussed.

Engineering Laboratories.

A paper on this subject was lately read by Professor B. W. Kennedy before the Institution of Civil Engineers. The author is well known as an authority on the subjects of testing the strength of structures and materials, and the technical education of engineers.

The author stated that a young engineer should obtain his practical training in a workshop. But this was incomplete even on its own ground, and practical teaching fairly within the scope of a scientific institution should at the same time supplement and complete workshop experience without overlapping it. In an ordinary pupilage a young engineer did not have much opportunity of studying such things as the physical properties of the iron and steel with which he had to deal, nor the strength of those materials, nor the efficiency of the machines he used, nor the relative economy of the different types of engines, nor the evaporative power of boilers. He required such experience as might help him to determine for himself, or at least to see for himself how other people had determined, all the principal engineering constants, from the tenacity of wrought iron to the calorific value of coal, or the efficiency of a steam engine, or the accuracy of an indicator spring, or the discharge co-efficient of an orifice. This kind of practical experience could be gained best in an engineering laboratory, in connection with some institution where technical instruction was given. He claimed that, in the matter of engineering laboratories, as a branch of technical education, England had really taken the lead, instead of being, as was too often the case in such matters, in the rear.

The chief function of some laboratories was original investigation or research, and of others the practical education of young engineers. The principal subjects upon which experiments in an engineering laboratory might be carried out, were as follows: (i.) Elasticity and the strength of materials. (ii.) The economy, efficiency, and general working of prime movers, and especially of the steam engine and boiler. (iii.) Friction. (iv.) The accuracy of the apparatus commonly used for experimentation, such as springs, indicators, dynamo-meters, gauges of various kinds, &c. (v.) The discharge over weirs and through orifices, and hydraulic experiments in general. (vi.) The theory of structures. (vii.) The form and efficiency of cutting tools. (viii.) The efficiency of machines, especially of machine tools, and of transmission gearing. (ix.) The action and efficiency of pumps and valves. (x.) The resistance of vessels and of propellers, and experiments in general connected with both. The paper dealt principally with the three first subjects.

Testing machines for laboratory purposes, specially the Werder machine, used by Bauschinger and largely elsewhere in engineering laboratories on the continent, the vertical machine of Mr. J. H. Wicksteed, and the horizontal machine of Messrs. Greenwood and Batley, on Mr. Kirkaldy's principle, used by himself, were compared in detail as to accuracy, mode of applying load, methods of making observations, adaptability for varied experiments, simplicity, and accessibility. The author preferred the Greenwood type. The method of testing employed by the author, with pump accumulator and Davey motor, was then described and illustrated.

Apparatus for the measurement of minute extensions, compressions, etc., occurring below the limit of elasticity, were next discussed, including those of Professor Unwin, Professor Bauschinger, Mr. Stromeyer, and the author, as representing micrometric, optical and mechanical exaggeration of strains. Automatic test-recording apparatus was next dealt with, Professor Unwin's, Mr. Wicksteed's, Mr. Ashcroft's, and the author's diagramming machines being mentioned and illustrated. Automatic diagramming apparatus for elastic strains was next discussed. The paper contained *fac-similes* of various diagrams, both ordinary and elastic. In concluding this section of the paper, brief references were made to machines for transverse tests, torsional tests, sheering tests, cement and wire tests, secular experiments, experiments on repeated loads, etc.

In discussing the designs of an experimental engine for laboratory purposes, the author first enumerated the principal conditions under which such an engine should be capable of working, summarizing them thus: (i.) Condensing or non-condensing. (ii.) Simple or compound. (iii.) Compound, with cranks at various angles. (iv.) With the greatest possible variation of steam pressure. (v.) With the greatest possible variation of cut-off and other points in the steam distribution. (vi.) With the greatest possible variation of brake-power. (vii.) With considerable variation in speed. (viii.) With or without throttling. (ix.) With or without jackets, and with varying conditions as to their use. (x.) With variation of clearance spaces. (xi.) With variation of receiver-volume. (xii.) With or without arrangements for intermediate heating. (xiii.) With variation in the reciprocating masses. He then enumerated the principal quantities which had to be measured during an engine test, and described the arrangement of an experimental boiler. A list was given of the principal experimental engines in existence.

Under the head of Friction-Experiments, the principal points were summarized upon which experiments were required, in order that anything like a complete theory of friction in machines might be worked out. These included the variations of velocity, intensity of pressure, extent of contact, temperature, lubricant, method of lubrication, and nature of rubbing material. Friction measuring machines, used or proposed by Professor Thurston, Professor R. H. Smith, Mr. Tower and himself, were briefly described. The paper concluded with a few remarks on laboratory experiments connected with hydraulic work, the theory of structures, the form and efficiency of cutting tools, the efficiency of machines and of transmission, the action and efficiency of pumps and of valves, and the resistance of vessels and propellers.

In an appendix there were added:—(a.) Forms used by the author for conducting engine trials. (b.) Notes on the principal engineering laboratories in Europe and in America, with brief accounts of the chief apparatus used in each.

* See the *Railroad Gazette*, Aug. 6 and 13, 1886; also an article in present issue.

† The most important facts on this point will be found on another page of this issue.

Railroads in Ecuador.

The Republic of Ecuador has been behind-hand in the march of development which has characterized the South American republic during late years. Up to the present time not a single mile of track has been built in that state, although the capital, Quito, has a population estimated at 80,000, situated only 120 miles from the coast.

The difficulties of construction through the intervening mountainous country have probably deterred projectors from undertaking the work, but by a survey recently made at the expense of the Government, an easy route has been found from the table land on which Quito is situated, to the Port of San Lorenzo in the northern part of Ecuador, and a concession for construction has been granted to two American engineers, Messrs. Finley & Wiswell, who are reported to represent a combination of New York capitalists abundantly able to carry out the work.

By the terms of the concession the government of Ecuador grants a subsidy equivalent to 6 per cent. upon $27,000 per kilometre (equal to about $45,000 per mile). This grant is not in the nature of a guarantee or claim upon the revenues, but is a direct donation and is secured to the railroad company by charge upon the customs revenues of the port of San Lorenzi, where the construction of the railroad will, it is expected, develop important commercial relations with the outside world.

Simultaneously with the inauguration of this policy of internal development, we find in the report of the Minister of Finance the recommendation that Congress should consider the existing foreign debt of the Republic, and arrange with creditors some basis of adjustment and resumption of payment.

The finances of the Republic according to the report above cited seem capable of sustaining an equitable annual payment of interest, the receipts and disbursements during the year being as follows:

Receipts of all kinds	$4,043,204
Disbursements	3,929,934
Surplus	$113,270
The foreign debt, exclusive of the interest in arrears, amounted to	11,400,000
The customs revenues of Guayaquil, the principal port of Ecuador, were	1,002,352

By the terms of the foreign loan held in England, bond-

holders are entitled to a minimum of one per cent. interest until the receipts of customs exceed $400,000, whereupon they shall be entitled to an additional one per cent. for each $400,000 of increased revenues. On this basis the foreign debt is at present entitled to receive 2½ per cent. return. Doubtless a composition could be arranged, however, more favorable to the Republic, and the subject will be introduced in Congress at its next session by a message from the President.

Contributions.

Widening Gauge on Curves.

PROVIDENCE, R. I., Jan. 10, 1887

TO THE EDITOR OF THE RAILROAD GAZETTE:

Permit me to add my testimony as to the advantage of widening gauge on sharp curves. The sharp curve (27° 20′) laid on this road last spring could not, in my opinion, have been operated if the rails had been laid to gauge.

The gauge adopted, 4′ 10″, gives very good results. We have hauled eleven loaded passenger cars with one locomotive round this curve with perfect ease. In fact we find that when compelled to stop on the curve a train starts easier than on a 10° curve laid to gauge. The outer rail is elevated two inches, the rate of speed being 10 miles per hour.

WATERMAN STONE.

Bent Rail Stop Blocks.

MISSOURI VALLEY, Iowa, 21st Jan., 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The "stop block" illustrated in the Gazette of January 14 certainly has the advantage of economy over the old "butting post." It has been used for some years in this vicinity, and is recommended as the cheapest and most efficient device in use for stripping trucks from car bodies. J. S. W.

Elevation of Curves.

INDIANAPOLIS, Ind., Jan. 14, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Jan. 7, a correspondent, writing on "Elevation and Gauge of Curve," tells of an accident that happened to a train on a 15 degree curve on a 3 ft. narrow-gauge railroad, in which he says: "The course and cause of this accident was as follows: First, the truck of the coffee car left the track owing to the impingement of the flanges on the outer rail, due to the extreme tightness of the gauge. Then the badly loaded coffee sacks on the upper side of this car were tumbled down to the lower side by the bumping on the ties, and the car turned over, carrying after it the other cars and the locomotive, which were dangerously near the point of unstable equilibrium, owing to the great elevation of the outer rail." While I think the cause of box car turning was the sacks falling from upper to lower side of car, yet I do not think the impingement of flange that caused car to get off was due to extreme tightness of gauge, as the gauge was 3 ft., same as rest of the road. I think the gauge was right. If the 42-ton Consolidation engine could go around this curve, there should be no difficulty with the gauge for the box car. The flanges of the outside wheels under cars, when on a sharp curve, stay hard against gauge side of outer rail, unless something is wrong with bearings so the truck cannot slew to accommodate itself to curve. The truck of a car will run around a very sharp curve when its bearings are all right and the car is not overloaded. In all big yards in cities there are sidings where cars go easily, and when they have to be taken out, a small "bobtail" engine has to be sent after them on account of curve being too sharp for a common engine. It is the long connected road engine that has a flange for impingeing on gauge side of inner rail. A road engine will go around a 15 degree curve in a yard easily and without any widening of gauge. When it will do this there can be no trouble with the gauge of a 6 or 8 degree curve on main track. When a track is laid to gauge by a track layer the gauge gets an eighth of an inch wider when the first train is run over it, and the rail is pressed down and out to spikes. Then on a curve the outside rail is all the time wearing, and flanges of wheel wearing. When a gauge on main track is widened we have too much oscillation, and in a short time more wide gauge than we bargained for.

I think the impingeing of flange on outer rail was caused by too much elevation, there being too much load on inner rail. The more weight there is on inner rail the more the flange of outer wheels will impinge on outer rail. In laying track with a push car I found when car was loaded heavy with rail and run on a sharp curve that axles of car would bend in centres and every few feet spring over on inner rail an inch at a time. I saw that the inner rail was the cause of the resistance. When I oiled the top of inner rail so as to assist outside wheels in forcibly pushing inner wheels sideways, the car ran easier and pushed with half the power and the axles stopped springing in the centre. The outside rail has to do the turning for its own wheels and also for wheels on inner rail which, when heavily loaded, offer stubborn resistance in sliding over on inner rail. On my division we have dump-cars that are built on a flat car 30 ft. long and 11 ft. wide, 4 dumps on a car—2 on each side—each dump-pocket holding 2½ yards, 10 yards to the car. When the 2 dumps on one side of car are unloading, we have to be careful to see, before going in on a switch turnout, that it is not the 2 dumps on inside of curve that are loaded, as the flange of the outside wheels climbs outer rail, there not being weight enough on outside wheel to keep down the flange against the resistance of loaded wheels on inner rail. The question of elevation seems to be pretty well settled in the eastern country. On some of the far western roads they still claim great elevation, a good failing.

A trackman has no rule for elevation; he governs himself according to certain principles and circumstances; he does it the same as a race-horse in running around a circular course; the faster he goes the more the animal will lay himself to the inside. He knows exactly how much to list his body. A man riding a bicycle on a curve or turning a corner knows just how much to lean in; it all goes according to speed. There is always one place on a road where a train can be run faster than any other. When an engineer gets to this place it is generally after climbing a grade where he perhaps lost a little time. He will then use the leverage the down grade on his side of the hill gives him on the train and he will skip the hollow. The hollow is a bad place for a curve, but if the excessive elevation of 6 in. wont hold the top-heavy coaches from balancing out elevation is powerless, and speed of trains should be reduced by cutting some off the top of the hill and putting it in the hollow, which, perhaps, should have been done when the road was graded. M. R., ROADMASTER.

Sandberg's "Goliath."

LONDON, Jan. 8, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with great interest Mr. M. J. Becker's letter of the Dec. 15, in your issue of Dec. 24, on the breaking of rail-joints from want of strength. His remarks are perfectly true, but I would add that one reason is because the rail itself is not strong enough for the duty imposed. The overloaded rail bends like a whip, and the line forms a wave before the train, the joint, being the weakest part of the line, goes first, but had the rail been strong enough not to form a wave, the joint would not have broken. This was the conclusion arrived at in my paper on "Steel Rails and Rail Joints" read at the Institution of Civil Engineers, which you have republished. I am glad to see it is acted upon both in Europe and America, for the Belgian State Railway has adopted the 100-lb. rail, and Messrs. Cockerill, of Seraing, are now making it, and I hear at Bethlehem Steel Works an order is executed for a rail 90 lbs. per yard, so there is dawning a better state of things, heavy rails being introduced as fast as circumstances will permit.

But there was another problem in the said paper which I was unable to solve, and that was: Why do angle-joints break in America and not in Europe? This I will now attempt to explain, but should be very glad to be corrected by any of your readers.

We have certainly overloaded rails in Europe as well as in America, but we hear of no more joints than rails breaking. The reason of this, I believe, lies in the rail sections used, which are very different in the two countries. In America it is ow with a big head, only giving room for a small fish whether plain or angle, of say 2½ in. vertical height for, a 65-lb. rail. In the European section of equal weight there is room for a fish 3½ inches high, because the section of rail is high with a small head. The Swedish fish-plate is nearly ⅛ in., and the German ¾ in. higher than the American. The Swedish rail is ¼ in. and the German 5/8 in. higher than the American, although the weight of the latter is 65 lbs., and of the former two sections 63 lbs. per yard. The Sandberg's "Goliath" 100 lbs., as it is called in Belgium, is 1¼ in. higher than the American 65-lb. little "David," and the fish-plate ¾ in. higher. Now, if the stiffness of rail and fish is as to the square of their heights, where is the little "David" with his big head and low fish? Every train passing will form a wave, and after some millions of waves the line will bend on its weakest points, the rail-joint. If this represents the truth we can console ourselves in Europe from the fear of breaking of rail-joints in thousands as in America, but we may tumble into another danger equally great, and that is the breaking of the rails themselves through increased rigidity by the extreme increase of height of our rail sections. I therefore hold "no extremes," but a happy medium and substantial rail section, as well as fish-plates capable of doing their work without beeaking. As for the Clark Fisher joint, there would be ample room for its adoption to improve the roads with the present weak rail, particularly in America with its low section; and even in Europe I have advised its adoption for special cases, but I am not yet convinced of the condemnation of angular fish-joints; in fact, I know of no better. If I had, I should have applied it to my "Goliath," which I trust will not be killed by "David." C. P. SANDBERG.

TECHNICAL.

Locomotive Building.

The Pittsburgh, Fort Wayne & Chicago shops have received orders for 40 locomotives of the Class "S" pattern, all to be finished by the end of the present year, and to be delivered to the Pittsburgh, Cincinnati & St. Louis, and the Cleveland & Pittsburgh roads, which are operated by the Pennsylvania Co.

The Grant Locomotive Works, of Paterson, N. J., have an order for 20 engines for the Union Pacific.

The receivers of the Houston & Texas Central have ordered 10 new 10-wheel locomotives from Paterson, N. J.

The Buffalo, Rochester & Pittsburgh has ordered 4 new locomotives of the Brooks Locomotive Works, Dunkirk, N. Y.

The Car Shops.

The Laclede Car Manufacturing Co., of St. Louis, Mo., has recently received orders for street cars from the Kansas City Cable Railway Co.; from Beatrice, Neb.; from Ottumwa, Ia.; Salina and McPherson, Kansas.

Messrs. Schall & King have moved their office and the works known as the "Middletown Car Works" from Middletown to York, Pa., and are offering for sale, for immediate delivery, their stocks of gondola cars and passenger coaches.

The St. Louis, Kansas City & Colorado Co. has ordered 50 construction cars of the St. Charles Car Works, St. Charles, Mo., and several heavy locomotives of an eastern concern.

The Buffalo, Rochester & Pittsburgh has given orders for 300 new coal cars and 300 box cars. Of these 200 will be built at Harrisburg, Pa., 200 at Lafayette, Ind., 100 at Buffalo, N. Y., and 100 at Berwick, Pa. Another order for 500 cars is about to be given.

Messrs. Stroud & Co., of New York, have been made the agents in the Eastern states and in Canada for the Davenport & Fairbairn, Erie, Pa., chilled iron car wheels.

Bridge Notes.

The Union Bridge Co. has served two claims against the Harlem Bridge Commissioners, one for $67,000 and the other for $43,750. The first claim states that the Union Bridge Co. contracted in 1886 to build a bridge over the Harlem, the cost not to exceed $2,680,000. The contract was dissolved by mutual agreement. The company presented claims for $67,000, which were refused. The second claim explains the second contract, made after the first was cancelled, and which was for furnishing plans, etc., for a two-arch composite bridge. The commissioners claimed to be willing to compromise by awarding the contract of construction to the Union Bridge Co., in conjunction with Smith & Ripley, cost to be $2,058,000. The bridge company asserts that this combination was made impossible, because Miles Tierney, of Jersey City, could not be included in the contract, a condition insisted upon by the Commissioners. It is said that a new arrangement was made with him and the Passaic Rolling Mill Co. for a sum, $14,000, greater than the Union Bridge Co., with another masonry contractor, would offer. The matter is now being studied by the Controller.

Manufacturing and Business.

The Hydro Pneumatic Car Brake Co., capital stock $1,000,000, has been incorporated at Newport, Ky.

Mr. J. Q. Everson, of Pittsburgh, Pa., proposes to build a plant to make mortar, blocks and brick from blast furnace slag.

The Ries Electric Railway Manufacturing Co. has been incorporated in Portland, Me. Capital stock, $1,000,000. President, Robert F. Straine, of Boston.

The following figures show the increase in sales of the feed water heaters manufactured by the Wainwright Manufacturing Co., Boston and New York, with agencies in Philadelphia and Pittsburgh: From Nov., 1885, to May, 1886, 6 months, 997 H. P.; from May, 1886, to Sept., 1886, 4 months, 3,893 H. P.; from Sept., 1886, to Jan., 1887, 4 months, 4,462 H. P.

Iron and Steel.

The output of the Martel Furnace, at St. Ignace, Mich., for the last six months was 8,450 tons of pig iron. The furnace will resume operations about the 1st of next May.

The Elk Rapids, Mich., Furnace blew out for repairs on Dec. 23. It is the intention to get ready to blow in on the 10th of March.

The Moxahala Furnace at Nelsonville, Ohio, has passed into the hands of Messrs. King, Gilbert & Warner, of Columbus, Ohio. This furnace has not been in blast for four years. It has a capacity of about 100 tons of pig iron a day, and the purchasers will at once begin work with it.

The Hecla Iron & Mining Co., of Ironton, O., intend to erect a new furnace next to their present plant.

A plate mill will soon be put in operation at Thurlow, Delaware County, Pa., which will give employment to 100 hands.

D. Eagan, of the Shenango Machine Co., has secured land in Sharon, Pa., for an open hearth steel plant, employing 200 men.

The Laclede Rolling Mills, of St. Louis, Mo., have been running full during the past month, with the exception of a few days when iron ran short, and a part of the puddling force had to be laid off. The supply is now sufficient, and the 21 puddling furnaces, the bar, guide, plate and sheet mills are running day and night.

The Colorado Coal and Iron Co. produced 615,360 tons of coal and 112,200 tons of coke during 1886. They also manufactured 53,250 kegs of nails, 5,872 tons of steel rails, 9,323 tons of pig iron, and 3,370 kegs of railroad spikes.

The Rail Market.

Steel Rails.—Not many sales are reported, but prices are firm and quotations are $39@$40.50 per ton at Eastern mills, and $40 is said to have been refused for small lots.

Rail Fastenings.—The market is active and prices steady. Spikes are quoted at 2.60 cents per lb. in Pittsburgh; track-bolts, 3@3.25, and splice-bars 2@2.10 cents.

Old Rails.—The market for old iron rails is quiet, but they are firmly held at $26@$27 per ton at tidewater. Old steel rails are quoted at $24@$27 per ton in Pittsburgh.

Van Fleet's Model Locomotive.

A model locomotive, exhibited by the maker, Mr. F. Van Fleet, of Williamsport, Pa., has received a prize at the American Institute Fair, lately held in New York. The judge's report states that, though on a scale of ⅝ in. to the foot, or 1/19 of the real size, every detail is accurately represented. The pistons and valves are ground steam tight so accurately that the former will fall of their own weight. Some of the pipes are 1/16 in. outside diameter and only 1/32 in. bore.

The engine has an extended smoke-box, and is equipped with a Sellers' improved injector, Westinghouse air brake, both automatic and straight, on drivers and tank. The signal lamps are ½ in. long, and will burn twenty minutes. The engine is provided with a steam reversing gear designed by Mr. Van Fleet. The materials used are: Gold, silver, German silver, copper, brass, nickel, steel and iron. It contains some original features, viz., steam reversing gear, automatic coupler, improved tank lid stop, which will keep the lids open or shut as required, and a system of burning oil or petroleum in the fire-box of the locomotive.

The model was shown in practical operation by air pressure, showing the working of the air-brake system, injector, whistle, etc., with great distinctness.

Car Heating by Steam.

A train of cars is now being fitted with the Martin anti-fire car heater for the Chicago, Milwaukee & St. Paul Railway. Since the Rio disaster the Engineer of Tests has examined the various car-heating systems with the above result.

A Novel Car Heater.

The Union (Blue) street car line, on Pine street, is experimenting on one of their cars with a unique stove, if stove it may be called, which rests under a portion of the seat. This heating apparatus is composed of two metallic pans about 3 inches deep, surrounded by sheet zinc to protect the wood of the seat. The fire, which is of a peculiar kind, is liquid, and is poured into the pans, where it remains red-hot for a number of hours. The thermometer in the car is maintained at a comfortable degree, and the apparatus is apparently a clean and valuable adjunct.—*St. Louis Age of Steel.*

Cranes.

The Yale & Towne Mfg. Co., of Stamford, Conn., have lately completed a power traveling crane of 15 tons capacity and 80 ft. span for the Brooks Locomotive Works, at Dunkirk, N. Y. They are also engaged in building two power traveling cranes, each of 30 tons capacity and 60 ft. span for the new shops of the Wisconsin Central. Each crane has two 15-ton trollies. These cranes are for use in the erecting shop, and several hand travelers have been ordered for other shops.

RAILROAD GAZETTE

Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The action of the House in passing the Interstate Commerce Bill with but little debate by a great majority is a forcible illustration of how much our legislators are ruled by their desire to keep right with their constitutents, and how little by considerations of statesmanship.

Even the reasonable adherents of the bill, Mr. Cullom himself among them, are obliged to admit that this enormous interference with the business of the country effected by the pool and short haul clauses has been so superficially considered that the bill will have to go immediately to the courts for interpretation, and that the immediate effect of the short haul clause, if it can be made to work at all, will be to put certain trunk lines made up of independent roads at a great advantage, as compared with those whose whole line is under one management. Notwithstanding these facts, the national representatives hasten at the beck of a general clamor against the railroads, like the granger agitation some years ago, to turn this hastily digested scheme loose upon the business interests of the country.

It may be presumed that the President will sign the Interstate Commerce bill, in spite of its deficiencies, as being the expression of a loudly expressed popular feeling.

He will probably consider that the mistakes embodied in it will have to be shown experimentally before the country whose interests he watches over will be willing to concede them as such, and he may also feel not unjustly that he cannot be called upon to amend all the legislative errors of Congress, leaving that body the comfortable feeling of having complied with the wishes of its constituents without becoming responsible for ill-judged legislation.

December earnings are reported this week by six companies, five showing an increase and one a decrease. This makes 104 roads from which we have thus far received reports for December, the totals being as follows:

	1886.	1885.	Increase.	P.c
Reported this week, 6 roads.....	$918,783	$916,279	$2.504	0.3
Total, 104 roads....	34,748,879	31,207,095	3.541,784	11.3

The most important line reporting this week is the Northern Central, which closes the year with a decrease of 10 per cent. in gross and 26 per cent. in net earnings; for the year, however, it about holds its own in gross, but had a decrease of 13½ per cent. in net earnings. The New York Susquehanna & Western reports for December an unexpected increase.

Three of the six roads reporting this week give net earnings also, but all of them show a decrease.

The official report of anthracite coal tonnage makes the total shipments for last year 32,136,363 tons, an increase of 1½ per cent. over 1885. The tonnage was distributed among the companies very much as in the previous year, the percentages showing slight changes only.

The eastern competitive tonnage, which includes the coal sent to New England, to New York City, and the eastern part of New York state, continues to show a decrease in relative amount, having been last year 37.4 per cent. of the total, against 41.4 per cent. four years ago. Part of this reduction is due to the increase of the western shipments, but part also to the growth of the interior demand, in Pennsylvania, New Jersey, and Central New York.

Prices of coal have been, on the whole, fairly maintained, and the year, while not an especially good one for the coal companies, cannot be called a poor one. The anthracite companies are exceptionally placed all but one of them being carriers as well as miners and shippers, while five of the seven depend chiefly upon the coal business for the returns they may make to their stockholders.

A speaker at the recent meeting of the New England Railroad Club stated that he did not believe that stoves were the cause of the loss of life at the Ashtabula and Angola disasters. Such a statement carries its own refutation, but the same speaker proceeded to say that in Europe, where no stoves are used, many passengers are burnt to death in accidents, and that in Scotland, 40 passengers had on one occasion been burnt to death. This assertion is wholly incorrect. The accidents in Great Britain in which passengers have been burnt to death are exceedingly few, and in no case have so many as forty passengers lost their lives from this cause. Thirty-three passengers were, however, burnt to death after a collision at Abergele. The Irish mail struck a runaway car laden with petroleum, which was spilt on the ballast and caught fire from the engine. The burning stream then ran under the train, and the front cars were consumed before any one realized the danger. In another case a passenger upset a reading lamp in his berth in a Pullman car, and set it on fire. He probably could have escaped with the other passengers had he been sober. In another case a conductor was burnt by a gas explosion in a collision. The train was lit by coal gas carried in a large collapsible rubber reservoir in the baggage car. These, we believe, embrace all the lives lost by fire in train accidents in Great Britain during the last twenty years, a striking contrast to the great loss of life caused by stoves in this country. The fact that stoves are very dangerous to life in even a moderate collision is too palpable to be refuted by the citation of imaginary accidents in Europe. In Russia and parts of Germany where stoves are used people are burnt to death, while such an occurrence is practically unknown in those parts of Europe where stoves are not used. Both here and in Europe the experience is the same—the stoves do the mischief.

In another column will be found the tables showing the summaries made up from our monthly accident reports for 1886.

In commenting on the summary made a year ago we referred to the fact that one of the worst accident in 1885, that on the Hackensack Meadows on the Pennsylvania, was occasioned by the momentary forgetfulness of one man, in spite of a costly system of mechanical safe-guards, and said: "That all accidents can be prevented is not to be hoped for; but there is still very great room for improvement, and it is evident that a large proportion of train accidents belong to the class which might and ought to be prevented." In view of the Rio disaster in the year now under review, and of the Republic horror, which barely missed coming in the same year, we cannot express the state of the case any better than to emphasize the words above quoted. Machinery and appliances have been improved and re-improved, and in some directions have been almost brought to that golden goal so constantly aimed at, the point where a railroad will run itself without any employés; but human aid is still largely necessary and still, we are compelled to say, suffering greatly from lack of intelligent direction and organization. The free and easy ways of old school American railroading have been very materially abolished, modified or corrected; but that there is still an immense field for further progress no reflecting railroad man will deny.

The ideal optimist or railroad man with perfectionest tendencies would perhaps say that all accidents are preventable; and his notions must not by any means be wholly ignored by practical men if they would keep their aims high. It is a satisfaction, though, to be able to mention at least one class of casualties which the most advanced theorizers will agree in regarding as wholly unavoidable, the three derailments last August from the earthquake shock in South Carolina.

The Massachusetts Railroad Commissioners in their report on the Mitteneague accident say that the wheel on the broken axle partly turned the Lorenz switch and thus derailed the cars. This indicates that a trailing point instead of a facing point switch might have averted the accident or postponed it till the train reached a less dangerous locality. The Commissioners say that a call for legislation on the subject of car heating may be expected, and add:

"In regard to local travel within the state, this is a question for careful consideration of details. In regard to travel, including points in different states, other questions arise. Assuming the passage of the interstate commerce bill, it would be at least doubtful whether any state regulation would be constitutional which prescribed any form of safety device for cars engaged in interstate traffic. In the like matter of safety devices for steamboat transportation from state to state, Congress has been supposed to have sole jurisdiction. The chances of different regulations by different states, and of conflicting claims by rival inventors, are to be considered. While such considerations may unfortunately create difficulties and cause delay in legislation, they do not affect the duty of all railroad managers to use the utmost diligence in adopting promptly the best possible devices for protecting travelers from the danger of fire. No law forbids the use of any such device. The law of humanity demands energy and promptness in guarding against this most terrible of dangers."

SLACK AND ELASTIC COUPLINGS.

As was recently remarked in these columns, the fight is now not so much between individual couplers as between types, and it is not, therefore, surprising that many persons are anxious to ascertain whether the slack inevitable with link couplers is or is not absolutely necessary in order to allow heavy trains to be started.

Both Mr. Stanley Goodwin, on the Lehigh Valley, and Mr. W. P. Shion, lately appointed Vice-President of the New York & New England, are taking considerable interest in this question, and are, we understand, about to make experiments on this point on their respective lines. These trials will, it is understood, be made not to test the relative merits of individual couplers, but to determine whether as heavy trains can be started with tight as with slack couplings.

The phrases "slack" and "tight," are, however, somewhat incorrect. The real distinction has been defined as that between "loose slack" and "spring slack," but perhaps the phrases "slack coupling" and "elastic coupling" are more correct, and express the difference more clearly. A tight, or close coupled train, in the strict sense of the words, means a train which cannot be lengthened or shortened by any effort of a locomotive. Such a train can be made with a continuous draw-bar screwed up tight until the bumpers, buffers or dead-blocks are in close contact. But though a perfectly rigid train is admirably suited for continuous brakes, it is ill adapted for freight service, as it cannot be readily started. No one, however, proposes that such couplings should be used for freight trains. The advocates of the so-called tight couplers simply urge that the cars should be so coupled that no car can be moved without compressing the draw or buffing springs. The blow or jerk given in starting the cars is then not wholly received by the bumpers or links but is cushioned by the draw springs. It is very important to bear this simple fact in mind. The advocates of close or elastic coupling do not pretend that a train rigidly coupled throughout can be started as readily as a loose coupled train. In one case the whole train must be started at once, in the other each car is started in succession. The close or elastic coupled train can only be started when it is provided with buffer springs of sufficient strength, suitably arranged, and in any trial or discussion on the subject this fact must be recognized. The close elastic coupled train is started by backing until the buffing springs are compressed, and then reversing the engine, which is assisted for the first few strokes by the rebound of the compressed springs. It is obvious that the springs must have a certain strength and a certain range in order to perform this duty. If the springs are weaker than the maximum tractive force of the engine, the drawheads will be driven home before the springs can exert much force, and the same thing will happen if the drawheads or springs have insufficient range.

Provided ordinary drawheads comply with the conditions laid down above, a comparative test between slack and elastic couplers is easily made. A train fitted with ordinary drawheads being stretched, blocks of iron can be dropped between the drawheads so as to keep the links in tolerably close contact with the pins and thus make the train close coupled. We say "tolerably close" because some allowance must be made for the vertical rise and fall of the ends of the cars in passing over low joints, etc. This difference in level would throw a very severe strain on the links and pins unless some play was permitted to allow for the varying angle of the links from the horizontal line.

Unless these conditions are carefully attended to it is impossible to obtain trustworthy results as to the

relative influence of slack and elastic couplings on the power of a locomotive to start a heavy train. The close coupled or vertical plane system demands powerful draw and buffing springs, fully equal to the maximum tractive force of the locomotive, and the draw-bar must be arranged so as to give these springs sufficient range.

It is also useful to call attention to another point in this question of slack *versus* elastic coupling. The trial of the Park electric brake at Burlington, as reported in our columns on the 7th inst., has attracted much attention, owing to the fact that the simultaneous application of the brakes by electricity succeeded in stopping a train of 25 loose coupled cars without the slightest shock. This fact was probably unprecedented, and therefore naturally created considerable surprise. But it does not follow as a matter of course that any loose coupled train can be stopped without shock by an electric brake. The train on which the experiment was made on the 30th ult. at Burlington was composed throughout of exactly similar cars, all empty and all fitted with similar brake levers and shoes. It may be assumed that the pressure on the brakes was alike on each car of the train. What, however, would have been the result had some of the cars been loaded and others empty? It is evident that the brake-shoe pressure that was sufficient to stop the empty cars in a certain distance would have been unable to stop the loaded cars in that length, and that consequently the loaded cars would have pressed forward on the empty cars. In the train at Burlington it seems probable that no such action took place, for it is evident that as all the cars were of the same weight, and were all retarded by the same brake-shoe pressure, each car would stop in the same distance if left to itself, and no car would tend to press upon or retard its neighbor, and consequently no pull or compression would be exerted on the draw gear. Any shock would, therefore, be impossible. But would this be the case where some cars were pressed forcibly together and others drawn apart as far as the draw springs would allow?

As the brake is applied in a fraction of a second, this action would very probably cause shocks with loose or slack couplings.

If the shocks were mild while the brake was on, the shock when the brake was released would probably be severe. The forthcoming freight train brake tests at Burlington in April next will probably settle this and other questions.

We understand that the inventor proposes to so arrange the wires applying the brake, that the brakeman in the act of coupling the wires can arrange that the brakes on a loaded car are applied with proportionally greater force than on an unloaded car. If he can successfully carry this out in a simple manner, much will have been gained, and it seems probable that with such an appliance shocks may be avoided, even in a train composed partly of loaded and partly of unloaded cars. All systems of brakes at present in use seem liable to produce shocks under these conditions. The use of tight or elastic couplings undoubtedly mitigates these shocks, but as the whole importance of shocks depends upon their relative magnitude, experiment can alone decide whether a long train of loaded and unloaded cars can be stopped without an objectionable amount of shock.

UNION PACIFIC LEGISLATION.

The proposals for Pacific Railroad Legislation are becoming every day more confused; and it now looks as if, amid the conflict of opinions, nothing would be done. In that case, the Thurman act would remain in force, as at present; while a special commission will perhaps be appointed to look into the accounts of several of the land-grant roads, particularly the Central Pacific.

This would not be by any means a satisfactory result. If there is one point on which everybody is agreed, it is in regarding the Thurman act as a failure. It does not satisfy the government, because it does not produce the expected revenue. It is bad for the companies, because it forces them to set apart a sinking fund to be invested in the most unprofitable fashion. And, finally, the question what constitutes the "25 per cent. of net earnings," which they are thus obliged to set apart, involves dispute and litigation at every step.

Two sets of remedies have been proposed. One set of bills, like the Thompson bill of 1885, retains the methods of the Thurman act, but increases the percentage to be paid by the company. In present financial conditions this would probably be ruinous. Another set of bills provides for gradual liquidation of the debt by a system of payments extending over a long series of years. The trouble with these bills is that it is hard to make the payments high enough to protect the government without crippling the company. The same objection applies to Mr. Springer's bill compelling the company to meet the interest charges as they accrue from year to year in the future. For if these payments prevent the company from building branch lines, it will, as Mr. Adams says, probably involve an indirect loss to all interests concerned—those of the government as well as others—which will more than offset any direct gain from the receipt of the cash.

Nor can we expect much good to come from the proposed investigation. That there was a great deal of outrageous use of money, and some flagrant public corruption, no one will deny. If a commission can bring the facts home to the proper *persons*, and proceed against them, it would be a great public gain. But that it will advance the government in its dealings with the Union Pacific Railroad Company may well be doubted. In the first place the question of interest payments by that company has become largely a question of financial possibility, rather than of moral or legal obligation. No matter what the rights in the case may be, the United States will interfere with its own interests by charging "more than the traffic will bear." In the second place, the stock of the company is now largely in the hands of holders who bought it under the assurance conveyed by the provisions of the Thurman act—who are not only innocent of any past fraud, but, by the existence of that act, relieved from the responsibility for the frauds of those who managed the road previous to the passage of the act. In the third place, the men who are implicated in these charges are not now connected with the Union Pacific road, or even altogether friendly to its interests. And, finally, the men who prefer the charges are not above the suspicion that they do it in the interests of stock-jobbing, rather than of public finance; while Mr. Adams, in spite of the repeated efforts which are being made to cast imputations upon his character, stands out as a man who is likely to do better, for the interest of the government and the property-holders both, than almost any one else who could be named. And his demand for a settlement which shall settle something is one which everybody except stock speculators will approve.

TORPEDOES AND DISTANT SIGNALS.

The Chatham Square collision on the New York Elevated road, Jan. 19, brings into prominence the question of audible signals (either for independent use or as auxiliary to the ordinary visual warnings), the signal that was disregarded in this case having had one of Palmer's automatic attachments,* by which a torpedo is always placed in a position to be exploded by a passing train whenever the visual signal stands at danger. The apparatus worked all right, and the torpedo exploded, but as it was attached to the home signal, instead of the distant, there was not room for the engineman to stop after the detonation warned him. As we intimated last week, the rule requiring the concurrent consent of *two* men (engineman and fireman) before passing a specially dangerous point, would, if properly enforced, be an exceedingly strong safeguard, and doubtless would be regarded by many as a reasonably sure preventive of crossings collision and drawbridge tip-offs, but the principle of having *both* audible and visual mechanical reminders is an important one and should receive more careful attention than it has hitherto been favored with.

The very wide and general use of torpedoes must be taken as a sure indication that they are regarded as valuable in their place, in spite of any imperfections connected with them or their use; and this fact must also be taken as evidence that the principle generally involved in their use, that of having two signals, either as equals, or as principal and auxiliary, is generally believed to be a correct one. An audible signal can *compel* attention, while one appealing only to the eye may be, and often is, neglected; this, of course, does have a tendency to relax the vigilance of men who would watch more carefully for a flag or a semaphore if it were known to be the final and only safeguard, and the fact must not be forgotten; but that this justifies the general disuse of auxiliary signals is more than doubtful. Rather let us see if we have not here good reason for reversing the order and making the sound signal the chief reliance and placing the sight signal in the secondary place. And again, we have here a hint in the direction of making the visual signals themselves more noticeable and attention-compelling.

There seems to be in some quarters a feeling, though perhaps it does not amount to a conviction, that torpedoes are somewhat unreliable, that a certain proportion of them will always fail to explode; but there are good managers who give little weight to this argument and who feel quite willing to place important dependence upon them. Any doubt in this connection ought to be remediable, however, and we should be glad to hear from superintendents whose experience would throw light on the question. Where a failure occurs its cause should be carefully searched out and noted; if it be dampness, or age, or imperfect attachment to the rail, or ill-adapted means for making this attachment, or whatever it be, let it be remembered and compared, and cured.

But let us assume that torpedoes are reliable—many superintendents are ready to grant thus much—cannot their use be increased to advantage? English roads with their vast passenger traffic and impenetrable fogs, are compelled to use them by the million every year. We have adopted their semaphores and interlocking and distant signals without waiting in every case for increasing business to compel us to move; shall we omit this auxiliary safeguard till some great disaster results from our dilatoriness? Human beings always will be fallible, and some time within the next thousand years some other runner is likely to forget that Chatham Square signal; and, unless he has some better system of fortifying his memory than now exists, cause another collision, and a worse one. Nay, more, if we include the crossings of the country instead of confining the view to New York city alone, the thousand years may be reduced to days, or possibly hours.

The torpedo at Chatham Square did no good, because it was too close to the crossing: it simply filled the place of the street boy who informed the portly gentleman about the orange peel just *after* he had lost his equilibrium instead of just before. A home signal (semaphore), however near the fouling point, stands some chance of giving seasonable warning to a slow train, even with a thoughtless runner, for he has opportunity to recollect himself and turn his eye at any point within view before he reaches it. He *ought* to look at it say 1,000 ft. away; but he may not be past saving himself if he looks within 300 ft. of the post. With a torpedo, however, the first, last and only warning comes all at once; and that once, to be of any value, must give room for a stop after it is passed. With a train moving three miles an hour a torpedo at a home signal may perhaps be of more or less service, but with any reasonable speed it must be placed back some distance. Visual home signals should be exactly against the fouling point, so that if the torpedoes were placed back, say 500 ft., one would have to be exploded every time it became necessary to hold a train at the home signal; but this is certainly the only true principle to act upon. If a torpedo is to be attached to the home signal at all it must be placed back at the point where the runner *generally* is when he *looks at the signal*, so that on the average the two signals shall arrest his attention at the same moment. On the elevated, where all speeds are comparatively low, it might answer to make this 500-foot point the regular distant signal, but with ordinary speeds—30 to 60 miles an hour—the distance must be greater. A regular "know nothing" stop after passing a caution signal is of very doubtful utility, for the runner should, after being cautioned to look for an order to stop at the home signal, have as few distractions as possible: should be enabled so far as possible to keep his eye constantly on that signal until he reaches it, or until it shows clear. The practice of keeping the distant signal almost always in the cautionary position is a ticklish one to indulge in, for the runners tend to get into the habit of being their own judges and of regarding the home signal as really the only one with which they have to do. The location of crossings in or near important yards where much switching is done is a hindrance to the proper working of interlocking, but it generally cannot be remedied. The right way, nevertheless, is to have trains *usually* find both home and distant signals "all clear," taking care to have "danger" shown often enough to keep the runners alert.

The best and the natural place for the audible signal is opposite the distant semaphore; in times of dense fog certainly every such signal should be provided with this auxiliary, and with very heavy traffic a great relief from anxiety would result if one were constantly used. In dealing with principles it will not do to lay too much stress on the saving of torpedoes. The constant use of an attachment like the Palmer apparatus would of course involve the exploding of one for every train allowed to pass the distant signal while in the cautionary position, but every modification of this plan for the sake of saving trouble in adjusting torpedoes or money in buying them, complicates the train rules.

With the great improvements and simplifications in electrical devices now constantly going on, it is impossible to predict how soon we may have something

* Illustrated in the *Railroad Gazette*, Nov. 20, 1885, page 739.

much better than torpedoes to stop trains at such places as crossings and drawbridges. Various ingenious appliances for blowing a whistle in the cab, for shutting off steam, slapping the runner in the face, and other similar tricks have already been invented and it is not unlikely that some of them will be found to deserve and will receive attention and practical application in the near future. The field certainly is an inviting one. New-fangled notions receive one of their first rebuffs when the trouble and expense of careful and intelligent inspection is considered and shuddered at; but let the roads look at their own example in the past. What is there about a railroad that does not need constant looking after?

The Burlington Experiments on Slack.

The experiments made at Burlington last summer as to the effect of slack on the starting of heavy freight trains and the shocks when continuous brakes are used was referred to at the recent meeting of the Master Car-Builders' Club in New York. The figures were fully given in the *Railroad Gazette* at the time, but as the subject is exciting considerable interest just now, the following brief résumé of the result obtained at Burlington may be interesting.

The shocks in a 50 car train fitted with the Westinghouse brake were decreased from a movement of the slidometer of 10 ft. (estimated) to an actual movement of 20 in. by taking out 3 in. of loose link slack between the draw heads of each car. About ½ in. of loose slack and 7½ in. of spring slack then remained per car. The slack was taken out by means of a lot of 3 in. scrap arch-bars cut into pieces about 12 in. long, punched and riveted together near the centres, making a very snug fit in the links. No trouble was experienced from their jumping out.

The average of the various trains at Burlington showed the following amount of slack per car:

Link slack	3½ in.
Free draw-bar slack	½ in.
Spring slack	8 in.

The wedges above described took out 3 in. of this slack in the close coupling trials.

The tests as to the effect of slack on the number of cars which an engine could start were made on an ascending grade not exceeding 26 ft. per mile. It was found that in the trials without slack, trains of 50 loaded cars weighing in all 1,655 tons, could be started, but were stalled after running from 14 to 52 ft. The number of cars was then reduced one by one to 41, but the engine invariably stalled after running from 51 to 94 ft. Finally the engine managed to move 38 cars 550 ft. with some difficulty, but without any fear of stalling.

The tests with loose couplings were then made, with the same engine and train, the wedges being removed. A train of 38 cars was started in the same place and hauled with somewhat greater ease than the tight coupled train.

These trials show very conclusively that an engine can *start* as many cars with tight as with slack couplers, but that a train is most liable to stall when the train has moved forward about two car lengths, and when the method of coupling can have little influence on the resistance of the train.

Lighting Passenger Cars.

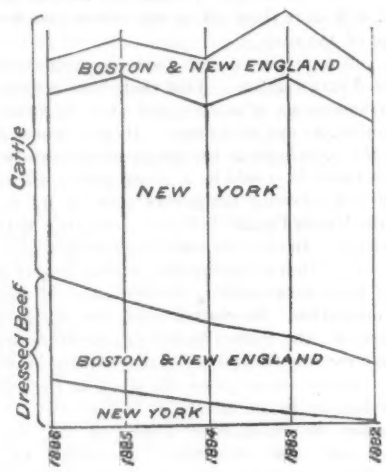
The London, Brighton & South Coast (England) have for many years run a train composed wholly of Pullman Parlor cars and lit solely by electric lights, and was probably the first railroad to use electricity for that purpose. The expense, however, proved to be great and the storage batteries used were very heavy, and later experience on other roads, such as the Pennsylvania, have not shown that electricity is the best possible agent for lighting railroad cars.

As, however, the usual method of lighting cars in Europe is even more defective than our own, it can scarcely be matter of surprise that the grumbles of passengers are both loud and deep. The defective light on suburban trains, where every one wishes to read the evening newspaper, has been an especial source of complaint. Experiments, however, commencing on Jan. 1, were to be made with six trains on the Brighton line, lighted with oil under new conditions, and six illuminated by electric lamps. The oil lamps will be filled with colza oil carefully selected, and fitted with wicks of the best quality, the glass will be clear and kept well polished, and reflectors of a new pattern will be introduced. On the electrically-lighted trains each compartment will be provided with one light of ten-candle power, and care will be taken to dispose the lamps in a way which will avoid shadows. The electricity will be generated by the locomotive.

The system of electric lighting is the joint invention of Mr. Stroudley, the locomotive superintendent, and Mr. Houghton, the electrician of the company. The dynamo is driven from the axle of the guard's van and fills the accumulators while the train is in motion, and there is thus always sufficient light stored for the longest stoppage. The whole apparatus is inclosed in a locked cupboard on one side of the guard's van, is quite automatic, requiring no care or attention, except occasional oiling. The system of lighting by oil lamps costs about $350 per train per annum. It is estimated that the lighting by electric lamps will cost about $500 per train per annum. It is understood that this system is highly approved by the British Board of Trade.

The London & Southwestern and many other English lines are using the Pintsch system, which is almost universally used in Germany. It is claimed that on the first named line, the Pintsch costs on through express trains .652 cent per lamp per hour, while oil lamps cost 1.250 cents. The oil lamps used, however, in Europe are more liable to breakage and cost more for cleaning and waste more oil than those used here. The Pintsch system is used on all the underground lines in London.

Dressed Beef and Cattle Traffic.



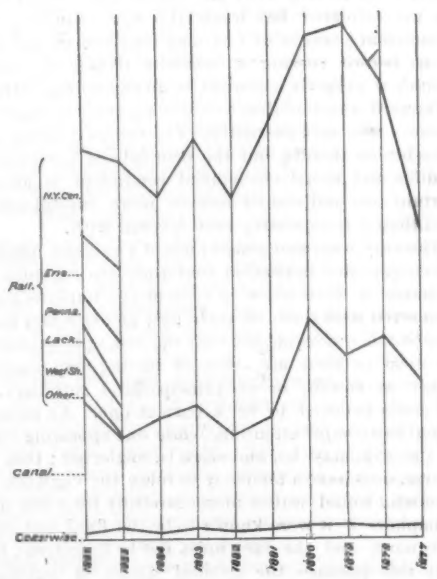
The course of the dressed beef and cattle shipments to New York and into New England by the trunk lines for the past five years is shown by the diagram herewith. The actual amounts in tons are given by the table below:

		1886.	1885.	1884.	1883.	1882.
New York	Dressed Beef..	69,789	53,344	34,956	16,365	2,633
	Cattle..	280,184	337,802	328,220	392,095	366,487
New England.	Dressed Beef..	153,544	138,876	121,017	116,746	89,150
	Cattle..	52 431	54,192	74,505	100,901	76,410

In explanation of the diagram, it is to be noted that the distance on a year line between any two of the traffic line shows the amount of the given traffic.

Thus the distance from the base to the top line is the total beef shipment, which shows but a slight increase from 1882 to 1886, while the total dressed beef business, shown by the second line from the bottom, has eaten steadily into the cattle traffic year after year without regard to the variations of the total trade. The increase in this business is particularly noticeable in the New York trade, whose dressed beef business is mounting up in an increasing ratio from year to year, as shown by the upward curve of its bounding line, while its cattle band is the most fluctuating thing in the whole diagram, falling off somewhat even from 1884 to 1885, as can be seen by measuring the relative length of the year lines in this band, notwithstanding the increase in the total business between those years.

New York Grain Receipts.



The receipts of grain, including flour reduced to bushels, at New York for the year 1886, were 4,272,631 bushels, or 3.4 per cent., greater than the receipts for 1885; being 130,910,062 bushels last year, and 126,637,431 bushels in 1885.

The increase and decrease in the quantities carried by the respective routes in 1886, as compared with 1885, have been:

	1886.	1885.	Inc. or Dec.	P. c.
N. Y. Central	27,372,525	36,079,712	— 8,707,187	24.1
Erie	20,663,906	24,979 531	— 4,309,615	17.3
Pennsylvania	10,049,575	15,229,591	— 5,180,016	34.0
Lackawanna	10,221,678	5,718,428	+ 4,503,250	78.8
West Shore	10,006,272	10,001 299	+ 4,973	0.0
Other	6,421,184	959,959	+ 5,461,225	569.1
Total rail	84,741,170	92,968,540	— 8,227,370	8.8
Canal	44,036,522	29,930,587	+ 14,105,935	47.1
Coastwise	2,132,370	3,738,304	— 1,605,934	42.9
Total	130,910,062	126,637,431	+ 4,272,631	3.4

While the total receipts in 1886 are over 4,000,000 bushels more than in 1885, the rail receipts have decreased about 8,000,000 bushels, notwithstanding the fact that last year there was one more rail carrier than theretofore (the Lehigh Valley), which brought to New York about 4,500,000 bushels, or about five per cent. of the total rail receipts.

Our diagram gives a clear view of the distribution among the trunk lines for the last 2 years, and for total rail, canal and coasting trade for ten years.

Probably the better rates on this traffic which prevailed in 1886 caused the Lackawanna to make greater exertion to secure a larger share of the business than it had previously obtained.

The total annual receipts of grain and flour at New York by rail, by canal, and coastwise, for the last 10 years have been, in *millions* of bushels:

	Millions of bushels.				P. c. of total.	
	Rail.	Canal.	Coastwise.	Total.	Rail.	Canal.
1877	50.9	48.3	4.1	103 3	49.3	46.8
1878	85.4	63.9	3.6	152.9	56.0	41.9
1879	101.9	57.0	4.2	163.1	62.5	35.0
1880	95.4	69.5	4.2	169.1	56.4	41.9
1881	98.6	38.2	3.1	139.9	70.4	27.2
1882	79.8	32.1	2 5	114.4	69.7	30.3
1883	79.4	41.2	3 7	124.3	63.9	33.1
1884	75.1	37.9	2.4	115 4	65.0	32.9
1885	93.0	29.9	3.7	126.6	73.5	23.6
1886	84.7	44.1	2.1	130.1	64.7	33.7

The effect on canal transportation of the low rail rates resulting from a railroad war can readily be seen by a comparison of the proportion of canal of total receipts in 1886 (33.7 per cent.), when rail rates were on a fairly remunerative basis, with its percentage in 1885 (23.6 per cent.), when a sharp railroad fight was going on. Another illustration will be, to compare the wheat receipts at New York during the season of open navigation in 1886 with the receipts for the same period in 1885. In 1885 the total receipts of wheat during the season of open navigation were about 21 million bushels, of which the canal receipts were 16 million bushels; in 1886 the total receipts for the same period were about 38 million bushels, of which the canal brought 31 million bushels. The total increase in 1886 being 17 million bushels, of which 15 million bushels was the increase in canal receipts. The total corn receipts and the receipts by canal during the season of open navigation in 1886 were practically the same as in 1885. The canal, however, is not so great a carrier of corn as it is of wheat. Last year it carried 10,700,000 bushels of corn, as against 30,800,000 bushels of wheat; in 1885 it carried about the same quantity of corn, and 16,400,000 bushels of wheat.

It would seem that last season must have been about the best season the canal boatmen have had in several years, so far as the grain business is concerned at least. Not only was the traffic larger than in any other year since 1880, but the rates were also higher. The average canal rate on wheat last year was 5 cents per bushel; in 1885 the average rate was only 3.8 cents; in 1884, 4.2 cents; in 1883, 4.9 cents. While the rates in 1886 appear to have been but very little higher than in 1883, the shipments were about 7 per cent. greater. The average rate in 1882 was 5.4 cents per bushel, but that rate included 1 cent per bushel for canal tolls, that being the last year in which tolls on grain were charged

While the railroads did not carry within ten per cent. as much grain to New York in 1886 as they did in the previous year, the business was certainly vastly more profitable. The tariff rates on grain last year were, from Jan. 1 to Dec. 19 on the basis of 25 cents per 100 lbs. from Chicago. On Dec 20 last, the rates were advanced to the basis of 30 cents. Though the 25 cent basis was in effect last winter, it is not considered a fairly remunerative winter basis when the increased cost of transportation during the winter season is taken into consideration. The tariff rates were probably not absolutely maintained last year (and probably never will be so maintained until the millenium arrives, unless the interstate commerce bill secures that desirable result), but there does not appear to have been any very serious demoralization. In 1885, the published rates on grain was at one time as low as the 15 cent basis, and shipments were reported to have been taken at 12 cents, if not, in some cases, even lower. At these rates, not only could there have been no margin of profit, but some of the business must have been carried at an absolute loss to the railroads.

Train Accidents in 1886.

Our records for last year have contained notes of 1,211 accidents, 501 collisions, 641 derailments and 69 other accidents; 58 per cent. of these caused no death and no injury worth reporting; of the remainder (513), 202 caused death to one or more persons, and 311 caused injury but not death.

The accompanying table gives in condensed form the showing of our records for the 14 years during which they have now been kept. Our readers will recollect that this record makes no note of casualties to persons, etc., when not connected with any injury to a train, and that it is kept chiefly for purposes of comparison, anything like completeness being out of the question as long as we have to depend chiefly upon the newspapers for our facts.

The number of accidents in each month for the last 14 years has been:

	1873.	1874.	1875.	1876.	1877.	1878.	1879.
January	178	108	131	60	147	75	113
February	133	90	211	91	56	67	88
March	112	88	122	109	58	49	61
April	101	59	60	56	69	46	30
May	79	89	54	64	46	50	37
June	90	83	61	52	49	56	64
July	90	64	73	79	53	54	81
August	150	73	114	78	98	75	79
September	106	89	116	106	84	76	78
October	88	81	88	101	82	61	104
November	76	82	87	96	83	68	86
December	80	74	84	88	66	63	69
Year	1,283	980	1,201	982	891	740	910

	1880.	1881.	1882.	1883.	1884.	1885.	1886.
January	62	223	137	168	147	145	94
February	64	149	89	184	120	216	98
March	65	113	90	142	115	86	81
April	71	63	81	106	88	81	66
May	46	85	94	120	76	62	93
June	56	73	72	91	71	75	75
July	78	102	92	119	89	76	91
August	112	129	139	144	89	92	115
September	124	144	153	158	100	91	135
October	120	131	136	174	105	123	118
November	145	133	125	122	96	96	130
December	135	113	148	112	105	74	115
Year	1,078	1,458	1,365	1,640	1,191	1,217	1,211

The influence of the weather (much the larger number always occurring in winter) is not shown in so marked a manner as in 1885, but is still plainly noticeable, the number of broken rails being more than twice as large in the first and fourth quarters as in the half year intervening.

The number of accidents for the year, 1,211, is 12 per cent. less than the average for the previous five years, and nearly 6 per cent. less than the number in 1873, when the railroad mileage (70,000) was but little more than *half* what it is now; so that, after making ample allowances for the various imperfections and deficiencies of the reports, there is still good evidence of a great advance in ways of working. It is proper to bear in mind that improved track, better equipment, interlocking signals, etc., are making a good record for themselves if they keep the accident record stationary, merely, and achieve no reduction at all. The train mileage, danger at street crossings and other elements have increased proportionately to the track mileage, and the weight of trains has also nearly doubled, so that nothing less than a good degree of vigilance and enterprise could have prevented the accident figures from taking an alarming jump upward. Managers are at liberty to point with pride to these figures as much as they choose if they will only be careful not to allow themselves to be distracted from the problems of the present and future.

The accidents *to passenger trains* last year and the year before may be tabulated as follows:

	1886.	1885.	Inc.	P. c
Collisions	183	98	Inc. 85	87
Derailments	220	247	Dec. 47	19
Other	37	51	Dec. 14	27
	420	396	Inc. 24	Inc. 6

Those who feel pretty confident that their passenger trains are all right, whatever may be said of the slow-going freights, can perhaps find instruction by pondering these figures. Quite a share of these were butting collisions.

Those interested particularly in passenger trains will also be interested in the fact that of the derailments from broken wheels and other defects of equipment, 20 out of a total of 122 occurred to passenger trains.

Of the total number of collisions we find 9 attributed to dispatchers' mistakes and 18 to mistakes in the understanding of orders, so that there may be room for improvement very close to headquarters on some roads. The need of quickened vigilance in management and discipline in general is partially shown by the following table:

CAUSES OF COLLISIONS.

	1886.	1885.
Train breaking in two	81	65
Misplaced switch	41	33
Failure to give or to observe signals	30	17
Mistake in giving or understanding orders	27	27
Cars run out of siding by wind, etc	14	9
Fog	15	10
Snow	12	9
Maliciousness	1	0
Flying switch	2	2
Previous wreck	2	8
Miscellaneous	0	9
Total explained	222	189
Unexplained	279	275
Total	501	464

The mistakes in orders in 1885 were divided between dispatchers and their subordinates in just about the same proportion as in 1886. Of course the words "Fog," "Snow" and some others are only conventional terms; when the millenium comes we shall not blame a fog for a collision any more than we now blame an iron switch stand when a thoughtless man leaves it in the wrong position. The ten accidents in the two years resulting from wrecks blocking more than one track are a forcible reminder of a constant possible multiplying factor which will always exist so long as derailments occur on double track roads. Quite a share of the unexplained collisions consists of comparatively unimportant bumps in freight yards, etc., but which, by reason of a casualty to some person or some peculiarity of circumstances, get reported in print. This is decidedly the case with regard to butting collisions.

The casualties caused by the different classes of accidents are tabulated as follows:

KILLED.	In collisions.	In derailments.	In other accidents.	Total.
1886	171	214	31	416
1885	158	141	8	307
Average for previous 5 yrs.	188	191	15	394
INJURED.				
1886	516	815	78	1,409
1885	547	963	20	1,530
Average for previous 5 yrs.	579	978	48	1,605

For four years past, the persons killed and injured are classified as follows:

KILLED.

	Pass.	Emp.	Total.
1886	115	292	407
1885	85	222	307
1884	89	300	389
1883	132	341	473

INJURED.

1886	736	742	1,478
1885	617	914	1,530
1884	1,016	744	1,760
1883	979	913	1,910

"Passengers" includes all persons other than employés on duty, which is coming to be misleading by reason of the large number of tramps killed in freight train wrecks. We shall have to recognize them and give them a separate place hereafter.

TRAIN ACCIDENTS—THEIR NATURE AND CAUSES FOR FOURTEEN YEARS.

	1886.	1885.	1884.	1883.	1882.	1881.	1880.	1879.	1878.	1877.	1876.	1875.	1874.	1873.
COLLISIONS:														
Rear	378	316	288	413	388	366	274	206	142	159	159	141	131	187
Butting	127	120	138	177	160	146	141	86	70	96	94	104	87	102
Crossing	36	28	27	39	30	24	22	18	7	13	15	18	19	31
Unknown	....	...	...	....	...	....	....	1	1	....	11	15	23	72
Passing	..	...	...	...	3	....	...	..	...	....	..	...	....	....
Total collisions	501	464	445	630	581	536	437	310	220	268	279	278	260	392
DERAILMENTS:														
Broken rail	45	102	60	84	37	85	45	56	17	46	50	107	4	111
Loose or spread rail	81	65	68	88	72	29	21	19	29	41	43	40	16	13
Broken bridge or trestle	20	32	34	35	38	44	16	17	21	21	20	26	33	19
Broken or defective switch	7	13	9	12	2	5	5	2	1	6	4	15	12	10
Broken or defective joint	1	...	...	1	3	4	...	...	2	2	1	10	5	3
Broken or defective frog	20	11	11	7	4	2	2	...	2	2	3	8	8	4
Bad track	....	..	....	..	....	....	....	....	....	....	4	....	13	7
Total defects of road	174	223	182	227	156	169	89	94	72	118	125	206	125	167
Broken wheel	37	41	22	40	33	58	21	21	5	12	22	33	20	26
Broken axle	62	48	30	60	52	50	30	30	18	43	38	39	20	21
Broken truck	14	18	12	24	14	10	7	11	13	8	10	15	8	7
Failure of coupling or draw-bar	3	6	3	2	....	...	1	2	4	1	1	3	7	8
Broken parallel or connecting-rod	....	....	....	....	1	1	2	....	....	....	..	5	....	....
Broken car	....	....	....	....	...	1	3	....	1	1	2	3	....	....
Loose wheel	....	....	....	3	1	4	....	2	...	1	3	2	4	2
Fall of brake or brake-beam	6	10	....	....	...	....	....	....	....	....	....	....	4	9
Broken tire	....	...	....	....	1	....	....	....	....	....	....	....	.. ..	....
Total defects of equipment	122	123	67	129	102	124	64	66	41	66	76	100	63	73
Misplaced switch	68	55	82	89	90	85	80	80	48	70	89	81	67	72
Rail (or bridge) removed for repairs	4	4	2	9	2	12	4	4	5	7	7	8	7	16
Making flying-switch	....	....	2	4	..	1	1	..	...	...	2	4	1	....
Runaway engine or train	2	...	3	1	2	1	5	1	2	1	....	3	1	6
Running through siding	...	...	.	5	1	3	5	3	6	3	6	2	3	3
Open draw	2	5	5	4	6	2	1	2	4	4	3	2	6	4
Carless stopping and starting	....	....	....	....	....	....	1	..	....	....	....	....	3	....
Overloading car	..	....	....	....	....	..	....	....	....	....	1	..	3	....
Bad switching	....	....	....	...	....	.. .	....	....	....	....	....	....	2	...
Total negligence in operating	76	64	94	112	101	104	98	90	65	85	108	100	93	101
Cattle on track	36	25	28	45	48	42	43	35	30	43	46	51	45	54
Snow or ice	27	30	7	13	5	15	8	22	13	25	16	36	13	9
Wash-out	23	22	25	25	23	18	17	11	36	17	40	44	10	30
Land slide	21	7	18	16	7	14	4	7	4	11	9	11	....	....
Accidental obstruction	17	17	42	53	37	45	25	24	26	22	36	37	51	44
Malicious obstruction	15	15	12	12	17	13	8	11	15	11	11	21	22	11
Wind	1	6	3	19	5	3	3	3	1	2	2	7	....	.
Man on track	....	....	....	....	2	....	....	....	....	....	....	....	....	2
Flood over track	....	...	....	....	...	....	....	....	....	....	....	....	....	2
Rail or switch purposely misplaced	24	13	17	16	....	....	...	....	....	....	....	....	....	....
Earthquake	3	...	....	....	....	....	....	....	....	....	....	....	...	....
Total unforeseen obstructions	167	135	152	199	144	150	108	113	125	131	166	207	141	152
Others (1 each)	..	...	..	...	...	...	1	2	3	4	1	5	10	7
Unexplained	102	136	186	259	238	310	237	192	175	177	185	222	218	315
Total derailments	641	681	681	926	742	857	597	557	481	581	655	840	655	815
ACCIDENTS WITHOUT COLLISION OR DERAILMENT:														
Boiler explosions	19	11	16	13	12	14	14	17	11	15	19	26	14	16
Cylinder explosions	2	...	2	5	1	1	3	1	1	..	3	3	6	3
Broken parallel or connecting rod	22	28	17	26	11	21	15	15	11	13	7	14	8	11
Broken axle	3	2	7	8	4	1	3	1	.	1	2	13	....	..
Cars burned while running	8	9	13	13	7	8	6	4	13	7	11	10	16	2
Broken wheel	...	8	4	7	1	20	....	....	....	....	....	....	....	....
Broken tire	1	1	...	1	1	....	....	3	....	1	....	9	....	....
Other breakages of rolling stock	2	6	2	7	3	....	1	2	2	4	4	8	16	19
Failure of bridge or trestle	....	....	....	....	....	....	....	....	....	....	..	....	2	..
Mass falling on running train	....	1	2	....	2	....	....	....	....	1	1	....	2	2
Accidiitional obstruction	2	....	2	2	....	....	3	....	....	....	....	....	....	11
Malicious obstruction	....	2	....	....	....	....	1	....	1	....	1	....	....	3
Other causes (1 each)	9	3	2	2	....	....	....	....	....	....	....	....	2	9
Total without collision or derailment	69	72	65	84	42	65	44	43	39	42	48	83	66	76

RECAPITULATION.

Collisions	501	464	445	630	581	536	437	310	220	268	279	278	260	392
Derailments	641	681	681	926	741	587	597	557	481	581	655	840	654	815
Other accidents	69	72	65	84	42	65	44	43	39	42	48	83	66	76
Total	1,211	1,217	1,191	1,640	1,364	1,458	1,078	910	740	891	982	1,201	980	1,283

The immigration into the United States, after reaching the minimum since 1879 in 1885, began to increase again last year. The figures for the last seven years are as follows:

1880.	1881.	1882.	1883.	1884.	1885.	1886.
586,068	716,868	712,542	560,196	453,983	326,151	386,755

Foreign trade also shows signs of renewed activity, the returns being as follows for the last two years:

	1885.	1886.
Exports	$688,249,798	$713,289,666
Imports	587,868,673	663,457,210

The delay caused to trains in Great Britain by the recent severe snow-storm appears to have been much exagerated in the cable dispatches. English newspapers since received state that snow began to fall about six o'clock in the evening of the Sunday after Christmas. A violent northesaterly gale sprung up and lasted till daybreak, when the snow ceased. Telegraph poles were broken and splintered for miles, solid brick walls were blown down, and in one case a tree was blown down and fell on the baggage car of a train in motion. As telegraph communication was practically suspended, some time was required to reorganize the train service and substitute flagmen for the block telegraph. The Great Western Railway was, however, so far cleared that the train leaving London at 11:45 a. m. on Monday morning reached Plymouth, 246¾ miles distant, at 7:30 that evening, giving an average speed of 31. 5 miles per hour, which would be considered a very fair schedule speed on a line having gradients ranging up to 132 ft. per mile. The corresponding train on another road between the same points arrived at its destination little more than an hour late. The difficulty of clearing the line of broken telegraph poles and wires is spoken of as greater than that of clearing away the snow. Some accounts state the snow was 18 to 20 in. deep for many miles, and meteorological reports give the fall as equal to from 1.76 to 2.91 in. of water in about eleven hours. This is a tremendous fall, especially when accompanied by a gale of unusual severity, as shown by the uprooting of trees, etc., that had survived the storms of half a century.

Record of New Railroad Construction.

Information of the laying of track on new railroad lines in 1887 is given in the current number of the *Railroad Gazette* as follows:

Chicago, Madison & Northern.—Completed to a point twenty-three miles north of Freeport, Ill., an extension of 13 miles.

Texas, Santa Fe & Northern.—Extended northward to Española, N. M., 4 miles.

This is a total of 17 miles for the week, making 60 miles reported thus far for the current year. The new track reported to the corresponding date for 16 years has been:

	Miles.		Miles		Miles.		Miles.
1887	60	1883	61	1879	52	1875	33
1886	23	1882	138	1878	72	1874	32
1885	26	1881	71	1877	22	1873	70
1884	41	1880	98	1876	44	1872	43

This statement covers *main track only*, second or other additional tracks and sidings not being counted.

NEW PUBLICATIONS.

We have received the Calendar for 1886-87 of the Imperial University of Japan, which, being printed in English, would at first sight give little intimation that it came from the other side of the world, but for the fact that the date is supplemented by a parenthetical statement that it is the "xixth year of Meiji." The year of the Christian era is given first, however, and the first intimation we have that there are anything but Caucasian surroundings is in such notes as "March 21st: Holiday of the *Shimki Korei Sai*." The pamphlet is of little interest to railroaders, except that in the engineering department are the names of a number of professors and teachers who are graduates of American Colleges and Universities. It is only one of the many striking evidences of the important influence Americans and Englishmen have in the national life of Japan. Webster's spelling-book has recently been reprinted there, and is "selling like hot cakes." The booksellers say that half the books they sell are printed in English.

TECHNICAL.

Sale of Old Iron Rails.

The Swedish State Railway offers for sale 1,500 tons serviceable and 6,500 tons rejected iron rails. Particulars may be obtained from the Royal Administration, Stockholm, Sweden. Bids should be sent to the same place by Feb. 15 next.

A New Automatic Electric Signal.

The Boston & Lowell Railroad is experimenting, between the West Somerville and Arlington stations, with an ingenious and novel signal and danger alarm for use previous to its general adoption, provided its operation is satisfactory. The invention consists of a generator of electricity, placed on the engine, and connected with the rails by a suitable device to convey the electric current from the generator. In the cab of the engine is a gong or target, which will ring a safety signal, if the tracks are all clear, the rails in place and not broken at any place, the switches and draw-bridges all closed and locked, when a train is entering upon a section of the road. Should there be any displacement or obstruction upon the track, the gong will sound a danger signal, and a target will appear before the engineer, showing the words "danger slip," and the target will remain at danger until the trouble is removed, or until the entrance is made on the next section, when it returns to safety. At no time can an engineer approach danger except at a distance in which he can stop his train or bring it under perfect control. Another new and important feature in the invention is that all switches and draw-bridges are locked by the train immediately upon entering the section where they exist, and they cannot be opened until the train has passed.—*Electrical Review.*

The New Works of the Rochester Car Wheel Company.

The new works of the Rochester Car Wheel Company at East Rochester are in operation, and are conveniently situated on a tract of 13 acres adjoining the New York Central. The new works were designed by Mr. C. S. Ellis, architect, Messrs. Ellsworth & Grant being the contractors.

The main or foundry building is 243 ft. long and 80 ft. in width. It is well lighted and ventilated, and experienced foundrymen are greatly pleased with its design. Directly through the middle, running lengthwise, is an iron walk, on either side of which are located the molding floors, each with a crane in the centre. The capacity of each is 21 wheels, and as there are eleven floors, 225 wheels can be turned out daily. The cupola room is south of the central portion of the foundry, and the molten metal is wheeled to the various floors, and by means of the cranes turned into the molds. There are two cupolas, but only one will be used as a general thing, it having a capacity of from 60 to 65 tons per day. The cupola elevator was made by L. S. Greaves, of Rochester.

Power is furnished by a 100 horse-power Root boiler, which supplies steam to an 80 horse-power Green-Corliss engine, made by the Providence Steam Engine Co. Conveniently near the engine rooms is another building for coal, coke and sand, on the upper floor of which is the pattern department.

The entire length of the company's tract, a distance of 1,800 feet, is traversed by two railroad tracks running directly to the shipping room. The cost of the buildings and improvements, exclusive of the purchase price of the land, will exceed $50,000. The office is located in a separate building, just east of the foundry, and is finished in oak, the work having been executed by the Hayden Furniture Company. The buildings are heated by steam, the contractors for this portion of the work being Howe & Bassett.

The capital stock of the company is $100,000, all paid in. The officers are: President, Hon. William H. Barnum, of Connecticut; Vice-President, William K. Chapin; Secretary and Treasurer, Charles T. Chapin; General Foreman, Edward J. Campbell.

The yearly capacity of the new works is 18,000 tons of iron, which will make up into 60,000 wheels. When running at full capacity from 60 to 70 men will be employed.

Railroads in Peru.

It is said that contracts are soon to be made in Philadelphia for engines and rolling stock with which to equip all the roads in Peru, South America, and which are to be extended by an English syndicate. The object is to reach the renowned silver mines of the Cerra de Pasco, situated about 150 miles from the Pacific coast in a basin 1,200 ft. above the level of the sea. It is proposed to prosecute the work designed by Henry Meiggs, 10 years ago, which was to extend the Transandean, and to open a drainage tunnel, tapping the silver mines of Peru 150 ft. below the level of the present workings, thus carrying off the rapid accumulations of water that have always been a serious obstacle in working the mines.

The American Exhibition in England.

The main building now being constructed on the grounds of the American Exhibition of the Arts, Inventions, Manufactures, Resources and Products of the United States, at Earl's Court, London, is unique in several respects, and will in itself be a most interesting exhibit. The entire framework of the structure is composed of steel rails, such as are used in constructing railways. Two of these bolted back to back, with the T side out, make a very strong and really ornamental column. The only casting required is an angle piece and eye-bar, into which the ends of the rails are slipped. This frame will then be covered with plates of glass and sheets of corrugated iron. The advantages are many, including rapidity of construction—as an acre a week can be easily put up—and economy, no skilled labor being required to put it up or take it down; and when finished with, the material is as good and marketable as when first purchased. This invention permits the construction of large temporary structures, which can be quickly and cheaply built.—*Engineer* (London).

THE SCRAP HEAP.

Did'nt Mess Up the Track.

Eastern railroad superintendent—"Some delay up the road I hear." Telegraph operator—"Yes, two passenger trains going at the rate of 60 miles an hour came together at Cliff Crossing." "Cliff Crossing! There's a big embankment at that point." "Yes, both trains went over the precipice." "Well, it won't take long to get the track cleared, then. I was afraid it might be something serious."—*Omaha World.*

He Won't Live Long.

They raise most extraordinary young men in Pennsylvania sometimes. A member of the Legislature there was offered a pass over the Philadelphia & Reading, and this is the way he got out of it:

"*Receivers of the P. & R. Railroad Co.:*

"GENTLEMEN—I herewith return to you the railroad pass so kindly proffered me by your general manager, for the following reasons:

"First—I find in article 7, section 1, of the new state constitution, which was part of the oath administered to me, the following: 'I will support, obey and defend the constitution of this commonwealth; that I will not knowingly receive, directly or indirectly, any money or other valuable thing other then the compensation allowed by law.'

"Second—I also find in article 17, section 8, of the new constitution, the following: 'No railroad, railway or other transportation company, shall grant free passes, or passes at a discount, to any person except officers or employés of the company.'

"Hence, I cannot consistently accept any free passes over any railroad. Respectfully yours, I. C. DELLONE."

The Conductor Had "The Great Big Head."

Eastern Railway President—"See here, sir, I understand that after that last catastrophe you sent the survivors to their homes in distant states and charged the expense to the company?" Conductor—"Yes, sir." "Do you suppose, sir, that this railroad is a benevolent society? What did you do that for? Give me an unanswerable reason at once for your resignation, sir." "To prevent them from testifying before the Coroner." "Resign, sir." "Why?" "I want you for Superintendent."—*Omaha World.*

A Wonder Working Trip.

The myriad-eyed interest of the speculative and railroad world is centred on Mr. Jay Gould's peregrinations through the great Southwest. Every remark of his, every gesture or look, means something new in railroad construction; the careless absorption of a struggling rural line, or the casual flinging of a bridge across fierce waters. The yokels in the frontier towns seem none the greater impressed by his mysterious antics than are the worldly experienced men of nerve who read of his movements from the buzzing tape in New York. No one really knows what the outcome of Mr. Gould's trip will be except Mr. Gould. Surmise now stretches the Missouri Pacific from Newport News in Virginia to New Orleans, and in every conceivable direction, to any point where a barrel of flour or a bale of cotton is waiting to be carried somewhere. When Mr. Gould goes a-traveling the lack of nerve and self-sufficiency among masculines in the lower end of New York is made vividly conspicuous.

Special Mail Trains between New York & Boston

Postmaster Corse, of Boston, has gone to Washington to urge upon the Post Office Department the imperative necessity of a special fast mail train between New York and Boston. The last mail now leaves New York at 10:30 p.m. and reaches Boston at 6:25 a.m. The proposition that may be adopted is to have a train leave at 11:30 p.m. and reach Boston at 5:30 a.m. It is intended to run a train of 3 cars, one for express, 2 for the mail, and none for passengers.

A Dynamite Accident.

About 200 cases of giant powder in a magazine car of the Missouri Pacific road exploded while in transit on Jan. 25, near Fort Scott, Kan. There were 23 freight cars on the train and 15 of them were completely demolished, while the magazine car was blown to fine air. A brakeman was instantly killed. This was the one fatality, and very little human injury was otherwise occasioned. The shock from the explosion was something volcanic. In the city of Fort Scott there were $10,000 worth of plate glass broken among the buildings and many people rushed from their houses all terror-stricken from the fear of an earthquake. Window glass was broken at Nevada, Mo., 25 miles distant, and houses were shaken all over the neighboring country.

An Accident.

"Had an accident on the X—— road yesterday," remarked a traveling man.

"Is it possible! What was the nature of it?"

"The train came in on schedule time."—*Merchant Traveller.*

The Stars and Stripes.

Many of our readers are possibly unaware that the stars and stripes of the United States are of English origin. The East and West Junction Railway Co. (England) have published a novel guide, illustrated by photographs, under the title of "Shakspere's Country and the Ancestral Home of the Washingtons," which speaks of Sulgrave as "the ancestral home of the Washington family, from whom sprang the renowned 'Father of his Country,' George Washington, first President of the United States, and from whose coat of arms, still to be seen in the village, the American banner—the famous 'Stars and Stripes'—took its origin. * * * lies about three miles to the southwest of Morton Pinkey, in a secluded valley on the left-hand side of the road leading to Banbury. * * * Just outside the village, standing about two fields back from the road, is the ancient manor house erected by Lawrence Washington about the year 1560, still bearing on the spandrils of the outer porch his coat of arms, the 'Stars and Stripes,' inscribed on a shield, with his crest, a raven, above it."—*Western Morning News* (*England*).

Von Moltke as a Judge of Cigars.

Since Moltke's important speech at the Reichstag the papers are full of anecdotes relating to the General, and the following is one of them, related by Bismarck: "When on the eve of war even Moltke becomes talkative, and when we marched in 1870 he at once grew ten years younger, spoke with vivacity, took pleasure in champagne and choice cigars, and lost all his pedantry acquired while resting on the laurels he had gained in 1866. During the battle of Königsgratz, when victory was doubtful for hours, Bismarck approached Moltke, tormented by doubts and fears as to the result of the terrible struggle. Moltke sat silent on his black steed. He was observing the course of the battle, and it was impossible to attract his attention. But Bismarck had a little case in his pocket containing two cigars, one of excellent, the other of inferior quality. He offered the case to Moltke, and without speaking the General took it, examined the two cigars, and chose the good one without thanks. But Bismarck understood him. He put spurs to his horse and cheerfully returned to his post, for, thought he, if Moltke is still able to make choice of a cigar with such calmness of mind, it means that all is going on well."—*Western Morning News* (*England*).

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Delaware, Lackawanna & Western, annual meeting, at the office in New York, Feb. 21.

Providence & Worcester, annual meeting, at the office in Providence, R. I., at 10 a. m. on Feb. 7.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Illinois Central, 3½ per cent., semi-annual, payable March 1, 1887.

Pullman's Palace Car Co., 2 per cent. quarterly, payable Feb. 15, to stockholders of record on Feb. 1.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Master Car-Builders' Club* holds its regular meetings at the rooms, No. 113 Liberty street, New York, on the third Thursday in each month.

The *New England Railroad Club* holds its regular meetings at its rooms in the Boston & Albany passenger station in Boston, on the second Wednesday of each month.

The *Western Railway Club* holds its regular meetings at its rooms in Chicago on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

Foreclosure Sales.

The sale of the *Shenango & Allegheny* road by Henry Rawle and John Shedd, trustees, has been postponed 60 days.

Baltimore & Ohio Employes' Relief Association

The December sheet of this Association shows the payment benefits during the month as follows:

	Number.	Amount.
Accidental deaths	5	$6,000
Accidental injuries	314	4,139
Natural deaths	7	3,850
Natural sickness	463	7,210
Physicians' bills	130	993
Total	928	$22,192

The payments in the several departments were as follows: Main Stem, Transportation Department, 195; Machinery Department, 214; Road Department, 86; Philadelphia Division, 141; Trans-Ohio divisions, 167; Pittsburgh Division, 86; physicians' bills, 139; total, 928.

New England Railroad Club.

The regular monthly meeting of this club will be held at the rooms, Boston & Albany passenger station, Boston, on Wednesday, Feb. 9, at 7:30 p. m.

Subject for discussion.—HEATING AND LIGHTING CARS IN PASSENGER SERVICE. In consideration of the fact that it was not made entirely clear to the minds of many, at the January meeting, that efforts could be so adjusted to obstacles as to make it desirable to change the present methods of heating railroad cars, and in recognition of the importance of the subject, it was thought advisable to continue the question to the February meeting.

There have been developed several methods of heating cars by steam, which present separate and distinct advantages, one over the other. It is expected that these systems will be fully considered at this time.

In view of the many disadvantages of applying steam to the heating of cars, does it seem practical or desirable to adopt this system?

There is being considered at the present time, a system of lighting cars by electricity, by means of a dynamo placed in each car, operated by steam from the locomotive. This system will be described and considered at this meeting.

The merits of the water gas system will be presented, should time permit.

Electricians and all others interested are cordially invited to be present.

Those unable to be present are especially requested to communicate their views in writing.

Transportation in Congress.

The Senate has passed a bill authorizing the construction of a bridge over the Mississippi River at or near St. Louis between the Eads Bridge and the mouth of the Missouri River.

The Secretary of the Treasury sent a communication to the House in answer to the House resolution asking what would be the result to the treasury, and the effect upon the debts owed the United States by the subsidized Pacific Railroad companies, if the House bill No. 8,318 should become a law. After giving a statement of the present condition of the indebtedness, which was the same given a few days ago, in reply to a similar resolution, the Secretary says the constant semi-annual payments arrived at by the method prescribed in the bill is less than the correctly computed semi-annual payments by one-fifth of one per cent.; that is to say, this payment should be $1,858,057, instead of $1,854,304, the amount named in the bill.

Mr. Outhwaite, a member of the House Committee on Pacific Railroads, has prepared an amendment to the Pacific funding bill, which will be offered when the measure comes up for consideration. The amendment fixes the rate of interest at a decimal over three per cent. It is seen by the response of the Secretary of the Treasury to the resolution as to the effect of the House bill that the interest fixed by the bill is a fraction less than three per cent.

Mr. Charles Francis Adams, President of the Union Pacific, has appeared before the sub-committee of the House Judiciary Committee, and he declared that the action of the company in issuing $11,000,000 of trust bonds, and in declaring dividends in the presence of a floating debt, and of guaranteeing the interest on the Oregon Short Line, had all been done under legal advice from the company's counsel. Judge Dillon argued to satisfy the sub-committee that the company had not violated the law.

ELECTIONS AND APPOINTMENTS.

Chicago, Burlington & Quincy.—The official list of Passenger Agents is as follows: Traveling Agents: O. Warner, Chicago; H. D. Badgley, Detroit; A. G. Shearman, Cleveland, O.; R. McC. Smith, Columbus, O.; James A. Quinlan, Milwaukee, Wis.; C. W. Boardman, Indianapolis, Ind.; R. W. Gillespie, New Orleans, La.; E. J. McDole, St. Louis, Mo.; W. M. Shaw, Cincinnati, O.; W. S. Condell, Boston, Mass.; Fred. Wetheraid, Schenectady, N. Y.; Jas. Simpson and Frank Harrison, Toronto, Ont.; Harry E. Heller, Allentown, Pa.; J. D. Tenbroeck, East Albany, N. Y. Local Traveling Passenger Agents: Illinois Divisions, W. W. King, Chicago; Iowa Division, E. M. Ford, Des Moines, Iowa. General Traveling Passenger Agent: J. A. S. Reed, Chicago. Division Passenger Agents: H. D. Muck, Rock Island, Ill.; W. J. Davenport, Burlington, Iowa. General Eastern Agent: R. Tenbroeck, New York City. General Agents: J. M. Bechtel, St. Louis, Mo.; T. C. Tapping, Peoria, Ill.; W. P. Moore, Quincy, Ill.; A. Wingate, Des Moines, Ia.; E. T. Bradford, Hannibal, Mo.; Chas. Keith, Council Bluffs, Ia.; W. C. Locherty, New York City; James Wallace, Chicago. Soliciting Agent, Geo. R. Dunne, Chicago.

Mr. H. C. Orr will be General Southwestern Passenger Agent at Kansas City, Mo., vice W. H. Firth, resigned.

Chicago & St. Louis.—Mr. Norman Williams, President of the Chicago, Santa Fe & California, will perform, temporarily, the duties of President of this company, vice Mr. Hinkley.

Chicago, Santa Fe & California.—Mr. J. E. Curtis, formerly Division Superintendent of the Lake Shore & Michigan Southern, will have charge of the construction of this road, with headquarters at Madison, Iowa.

Connecticut River.—At the annual meeting held last week in Springfield, Mass., this company elected the following board of directors: N. A. Leonard, Springfield, Mass.; Oscar Edwards, Northampton, Mass.; William B. Washburn, Greenfield, Mass.; Charles S. Sargent, Brookline, Mass.; William R. Cone, Hartford, Conn.; A. B. Harris, Springfield, Mass.; Frederick Billings, Woodstock, Vt.; Augustus T. Perkins, Barnstable, Mass.; William Whiting, Holyoke, Mass.

Danville & New River.—Mr. J. C. Wrenshall has been appointed Receiver of this Virginia road.

Drummond & Phillipsburg.—The incorporators are: Gov. Hauser, J. T. Murphy and T. C. Power, Helena, Montana; A. B. Hammond, Missoula, Montana, and M. J. Connell, Butte, Montana.

Georgia, Carolina & Northern.—Gen. R. F. Hoke has been elected President of this company.

Lake Erie, Alliance & Southern.—The incorporators of this new Ohio company are: R. G. Richards, Silas J. Williams, Henry G. Morse, Robert Martin and Leonard Fryer.

Lehigh Valley.—Mr. John Nichol has been appointed Lost and Damaged Freight Agent and all reports relating to lost, over, or damaged freight should be addressed to him at Mauch Chunk, Pa.

Macon & Tuscaloosa.—Of this new company in Mississippi, R. C. Patty is the President; G. G. Dillard, Vice-President.

Missoula & Bitter Root Valley.—The incorporators are: Gov. Hauser, J. T. Murphy and T. C. Power, Helena, Montana; A. B. Hammond, Missoula, and M. J. Connell, Butte, Montana.

New York & Massachusetts.—The directors of this new company are: George P. Pelton, John F. Winslow, Oliver H. Booth, Edward Elsworth, Poughkeepsie; Henry D. Cone, Stockbridge, Mass.; William A. Miles, Copake, N. Y.; Peter W. Gallaudet, New York, and Samuel N. Aldrich, Marlboro, Mass. The officers are: George P. Pelton President; Henry D. Cone, Vice President; Edward Elsworth, Secretary.

New York, Ontario & Western.—Thomas Swinyard has been appointed assistant to the President; John B. Kerr, Attorney; James E. Childs, General Manager.

Peoria & Joliet.—The incorporators and first board of directors are: A. J. Moorshead, J. M. Grant, A. G. Kleinbeck, W. T. Witmer, and A. M. Seeley, all of Springfield, Ill.

Philadelphia & Reading Coal & Iron Co.—Mr. Austin Corbin has been elected President; William A. Church, Treasurer; William H. Taylor, Secretary.

Republican Valley & Wyoming.—The incorporators of this new Nebraska company are: G. W. Holdredge, J. W. Saylor, C. S. Dorman, W. A. Higgins and P. S. Eustis.

St. Louis, Fort Scott & Wichita.—Mr. J. H. Richards has been appointed Receiver of this road by Judge Brewer, of the Circuit Court of Kansas. He will take charge immediately.

St. Paul, Minneapolis & Manitoba.—Mr. A. L. Mohler leaves the office of Land Commissioner of this company to accept the position of General Freight Agent.

South Pittsburgh & Sequatchie Mineral & Railroad Co.—The incorporators of this new road in Tennessee are Gov. John C. Brown, Dr. Wm. Morrow, J. M. Head, Benton McMillin, John McMillin and D. B. Cooper.

Terre Haute & Peoria.—The following officers have been elected: C. W. Fairbanks, President; D. H. Conkling, Vice-President and Treasurer, and Andrew Stevens, Secretary.

Texarkana & Daingerfield.—The incorporators of this Texas company are: J. A. Baker, G. J. Gooch, of Houston, Tex.; H. G. Fleming, G. W. Burkitt, of Palestine, Tex.; C. S. Todd, W. L. Hudges, J. S. Smeltzer, Larry Car Klien, A. L. Ghio and W. H. McCarty, of Texarkana, Tex.

PERSONAL.

—Mr. W. J. Smith, Locating Engineer for the Union Pacific, was drowned in the Malheur Cañon, Oregon, on Jan. 4.

—Mr. J. R. Hoffman, a civil engineer of the Carthage & Adirondack road has severed his connection with that company and gone to Denver, Col.

—A Cincinnati dispatch reports that Mr. Eugene Zimmerman has resigned his position as Vice-President of the Cincinnati, Hamilton & Dayton Co., and will give his whole attention to the Chesapeake & Nashville road.

—Mr. W. E. Rich, a distinguished English mechanical engineer, died of brain fever, in his forty-third year, on the 29th ult. Mr. Ritch was a member of the firm of Easton & Anderson, and designed the large passenger elevators used at the stations of the Mersey Tunnel Railway.

—Mr. I. W. Raymond, who died in San Francisco, Jan. 14, aged 75 years, had been a prominent citizen of that place for many years. He went to California in 1850, and was for a number of years Vice-President of the Pacific Mail Steamship Co. He was also one of the incorporators of the Panama Railroad Co., and took a prominent part in many enterprises for the development of the Pacific Coast.

—Mr. F. W. Webb, the well-known Superintendent of Motive Power of the London & Northwestern (England) has been elected Mayor of Crewe, the town in which the locomotive works are situated. Crewe is essentially a railroad town, and the population has increased from 148 at the commencement of the railroad era to nearly 40,000 at the present time. Mr. Webb entered the works as an articled pupil 35 years ago and has risen gradually step by step to his present position. The locomotive works will turn out the 3,000th locomotive this year, and in conjunction with the steel works have made nearly all the steel axles, tires and boiler plates used on the line, as well as a large proportion of the rails, steel ties, bridges, roofs and signals. A large recreation park and new gas-works have been lately opened. The latter were designed by Mr. Webb, and embrace many new features, the retorts being heated by producer gas. The heat being more even and more easily regulated, the illuminating gas and coke are of better quality.

—Mr. Frederick Hobart has become Associate Editor of *The Railroad and Engineering Journal*, a work for which his wonderful knowledge of American railroad geography, methods and corporate organizations well qualifies him. He graduated at the College of the City of New York in 1860, and after serving a year in the Jersey City Locomotive Works enlisted and served through the late war, retiring as a Captain in the Ninth New Jersey Regiment. He then spent two years in the drafting room, designing mining machinery, and a year with Messrs. Kasson & Co., in drawing and perfecting the details of the then well-known Gerner boiler. He afterward spent three years in the drawing rooms of the Grant Locomotive Works before joining the editorial staff of the *Railroad Gazette*. During the past fifteen years, as news editor of this paper, he has acquired, and his phenomenal memory has retained and holds instantly available, an amount of information concerning the location, length, financial condition, organization and *personnel* of American railroads such as no other man at the present time can possibly have. His earnestness and many lovable qualities have endeared him to all his associates.

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

Year to Dec. 31:	1886.	1885.	Inc. or Dec.	P. c.
Balt. & Potomac.	$1,335,844	$1 323,091	I. $12,753	0.9
Net earnings....	512,147	554,540	D. 41,893	7.6
Des. M. & Ft. D..	339,610	382,420	D. 42,810	11.2
Net earnings..	87,595	120.419	D. 33.024	27.5
Mexican National.	1,729,113	1.511,551	I. 217,562	14.4
N. Y., Sus. & W.	1.129 440	1,062,355	I. 37,081	3.4
Northern Central.	5,474,617	5,490.922	D. 16.305	0.3
Net earnings..	1 931,949	2,235,308	D. 303,359	13.6
Valley (Ohio)...	614,755	569.192	I. 45,563	8.0
Eleven months to Nov. 30:				
Cape F. & Y. V..	$205,884	$188,103	I. $17,781	9.5
Net earnings...	101,329	86,627	I. 14,702	16.9
Det., B. C & Al..	217,480	... .	... .	....
Net earnings...	117,310	....	... .	....
Mil., L. S. & W..	2,150,578	1,258,029	I. 892,549	70.9
Net earnings ...	924,848	416 084	I. 508,764	122.3
Minn. & St. L....	1,400,436	1,584,264	D. 183,828	11.6
Net earnings...	451.563	523.205	D. 71,642	13.7
Oreg. Short Line.	1,778 606	1.677,726	I. 100,880	6.0
Net earnings...	475,075	528,066	D. 52,991	10.0
Month of November:				
Cape F. & Y. Vy.	$21,408	$16,769	I. 4.639	27 6
Net earnings...	8 936	6,420	I. 2,516	39.3
Det., B. C. & Al...	28,807	. .....	.... ..	....
Net earnings ...	15.408	.....	.....	....
Mil., L. S. & W..	204,799	132,994	I. 71,805	54.0
Net earnings ..	65,693	27,833	I. 38,160	137.1
Minn. & St. L....	161.854	171,555	D. 9,701	5.6
Net earnings..	67.920	60,143	I. 7,777	12.9
Oreg. Short Line.	160,320	177,800	D. 17,480	9.8
Net earnings..	51,310	48,475	I. 2,835	5.9
Month of December.				
Balt. & Potomac.	$109,608	$107,845	I. 1,763	1.6
Net earnings .	30,489	52,829	D. 22,340	42.2
Des M. & Ft. D...	35,537	35,000	I. 537	1.5
Net earnings..	14,215	17,803	D. 3,588	20.2
Mexican National.	150,105	129.685	I. 20,440	15.7
N. Y., Sus. & W..	112.545	88,405	I. 26,140	30.3
Northern Cen. ...	457,809	507,699	D. 49,890	9.8
Net earnings...	163.504	221.253	D. 57,749	26.1
Valley (Ohio).....	55,179	49,665	I. 5,514	7.0

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

Cotton.

Cotton movement for the week ending Jan. 21 is reported as follows, in bales:

Interior markets:	1887.	1886.	Inc. or Dec.	P. c
Receipts.....	76 542	48.321	I. 28,221	58 4
Shipments.....	99.859	69,064	I. 30.795	44.6
Stock, Jan. 21.....	366,428	493,250	D.126,822	25.7
Seaports:				
Receipts..... ..	155,884	110,310	I. 45,574	41.4
Exports	152,389	107,903	I. 44.486	41.2
Stock, Jan. 21.....	994,960	1,087,550	D. 92,590	8.5

The total movement from plantations for the crop year to Jan. 21 is estimated at 5,195,751 bales, against 5,111,934 last year, 4,805,610 in 1884-5 and 4,649,366 in 1883-84.

Coal.

Coal tonnages for the week ending Jan. 15 are reported as follows:

	1887.	1886.	Inc. or Dec.	P.c.
Anthracite.....	469,469	507,460	D. 37,991	6.5
Eastern bituminous.	248,682	169,247	I. 79,435	47.0
Coke	85,478	37,363	I. 48,115	128.8

The anthracite coal trade is entirely unsettled by the block in shipments resulting from the strike of the handlers.

The seaboard bituminous coal pool is reported as making progress toward completion, but there are still many details of the agreement to be settled.

Shipments of Nova Scotia coal for the year ending Dec. 31 were:

	1886.	1885.	Inc. or Dec.	P. c.
Cumberland County...	470,000	340,000	I. 130,000	38.2
Pictou County....	370 000	396,000	D. 26,000	6.5
Cape Breton....	586,000	518,000	I. 68,000	13.2
Total..... 1,426,000		1,254,000	I. 172,000	13.8

These figures give the coal sold and shipped; the total amount raised from the mines was about 10 per cent. in excess of the figures above.

Cumberland coal shipments for the week ending Jan. 22 were 41,290 tons; total to Jan. 22 this year, 141,658; last year, 115,074; increase, 26,584 tons, or 23.1 per cent.

Pennsylvania Railroad coal tonnage for the week ending Jan. 22 was:

	Coal	Coke	Total.	1886.
Line of road.....	173,133	88 689	261,822	210,102
From other lines..	90,784	2,345	93,129	77,242
Total..... ..	263.917	91,034	354,951	287,344
Year to Jan. 22....	784,967	261,951	1,046,918	749,916

Increase for the week, 67,607 tons, or 23.5 per cent.; increase for the year, 297,002 tons, or 39.6 per cent.

Abolishing Second-Class Rates.

The railroads from Chicago west having discontinued making second-class passenger rates, and having also under consideration the propriety of discontinuing the issue of land tickets, Commissioner Daniels has called a meeting of the passenger department of the Central Traffic Association for Jan. 27, with a view of taking similar action.

Rates on Railroad Iron to Colorado.

At a meeting of the Colorado Railroad Association on Jan. 20, it was agreed to reduce the rates on railroad iron from the Missouri River to Colorado common points sufficiently to permit the Eastern mills to compete for Colorado business. The new rate will be $10 per ton instead of $12 as heretofore.

Return Shipments of Machinery, Etc.

Commissioner H. S Rich, of the Colorado Railway Association, gives notice that the roads in that association will hereafter decline to receive shipments of agricultural implements, machinery, stoves, and stove furniture to be returned to manufacturers for any cause, unless all charges are prepaid or guaranteed, or unless a written order of the consignees for the return of the property is presented by the shippers.

Middle & Western States Association.

The Middle & Western States Freight Association met at Chicago, Jan. 20. A resolution was adopted to the effect that as the rates had been advanced from Pittsburgh and Buffalo to points West, the committees at other commercial centres were requested to make corresponding advances in the west-bound rates from such points.

Through Rates on Fruit from California.

On application of the California Fruit Union and Fruit Growers' Association, the Southern Pacific Co. have made a rate of $300 per car to Chicago on fruit in trains of 10 car loads, the time in transit to be not more than 24 hours longer than the passenger train time.

Northwestern Freight Pools.

A meeting of the Northwestern Freight Association was held at Chicago on Jan. 20, to consider the demand of the Illinois Central that an advance should be made in the through rate from St. Louis to St. Paul. The other St. Louis lines being against the advance, no agreement was reached, and the meeting adjourned subject to the call of Commissioner Faithorn.

Passenger Rates to Military Companies.

At a recent meeting of the Chicago Railroad Association, it was agreed that a rate of 1 cent per mile be made west of Chicago for all uniform military companies travelling in organized bodies to attend the national drill to be held in Washington in May next.

Division of Rates on East-bound Pacific Coast Traffic.

The Trunk Line Executive Committee, acting as the Standing Committee of the Joint Committee, have adopted the following resolution in relation to divisions of rates on east-bound business from the Pacific coast to the seaboard.

"*Resolved*, That, taking effect at Chicago and Mississippi River points on Feb. 1, 1887, and until further notice, when east-bound freight from points on the Pacific coast to the Atlantic seaboard is billed at through rates, the rail lines east of Chicago shall charge, as their proportion, 28 per cent. of such through rates, but on the condition that such proportion shall not be less than 25 cents per 100 lbs.

"The proportions or minimums east of Mississippi River points shall be the established eastbound percentages of the proportion or minimum east of Chicago.

"When through rates are not given, the regular tariff and classification of the Joint Committee shall apply thereon east of Chicago and Mississippi River points."

Northwestern Pool Percentages.

Commissioner Faithorn, of the Northwestern Freight Association, has made the following award, fixing the percentages of the various roads members of the association:

On West and North-bound Business:

Road.	Per cent.
Chicago, Milwaukee & St. Paul.....	25½
Chicago & Northwestern	22
Chicago, Rock Island & Pacific	16
Chicago, Burlington & Northern..... ...	14½
Burlington, Cedar Rapids & Northern..... ...	1
Central Iowa.....	1
Illinois Central	5
Rock Island & Peoria..	1
St. Louis, Keokuk & Northwestern.....	3
Wisconsin Central	8
Wabash, St. Louis & Pacific	3
Total, ...	100

On East and South-bound Business:

Road.	Per cent.
Chicago, Milwaukee & St. Paul.....	25
Chicago, St. Paul, Minneapolis & Omaha.....	20
Burlington & Northern	16
Minneapolis & St. Louis	14
Minnesota & Northwestern.....	14
Wisconsin Central.....	11
Total.....	100

The pool on east and south-bound business does not cover grain and its products, which is about 90 per cent. of the total traffic. The west and north-bound division includes all merchandise apd high-class freight. It is stated that in view of the Inter-state Commerce Bill becoming a law at an early date, percentages, probably, will not be put in effect.

Anthracite Coal Tonnage.

Anthracite coal tonnage for December and the year ending Dec. 31, as reported by Mr. John H. Jones, the Official Accountant, was as follows, the statement including the entire production of anthracite coal, excepting that consumed by employés and for steam and heating purposes about the mines:

	December.		Year.	
	1886.	1885.	1886.	1885.
Phila & Reading... ...	1,003.030	1,135,716	11,690,483	11,080,780
Lehigh Valley	596 919	629.057	6,184,456	6,107 445
Del., Lack. & West... .	477.634	388,944	5,172,023	4,987.834
Del. & Hud. Canal Co...	283.833	318.214	3,480,687	3,301.874
Pennsylvania Railroad..	288,550	301.348	3,478,895	3,393,685
Pennsylvania Coal Co..	110,975	145,642	1,392,179	1,500,086
N. Y., L. E. & W..... ..	70,400	77,904	731,650	651,226
Total..... 2,811,350		2,996,825	32,136,363	31,623,530

Decrease for the month, 185,474 tons, or 6.1 per cent.; increase for the year, 512,833 tons, or 1.6 per cent. All the companies, except the Pennsylvania Coal Co., show increases for the year.

The actual division of tonnage for four years has been as follows:

	1886.	1885.	1884.	1883.
Philadelphia & Reading...	36.38	36.94	36.30	38.50
Lehigh Valley	19.25	19.31	19.30	19 70
Del., Lack. & Western	16 09	15.77	16 92	16.00
Del. & Hudson Canal Co.... ...	10.83	10 44	10.93	11.10
Pennsylvania Railroad	10.82	10.73	10.30	8 70
Pennsylvania Coal Co.	4 35	4.75	4.55	4.80
N. Y., Lake Erie & Western. ...	2.28	2.06	1.70	1 20
Total..... .....100.00		100.00	100.00	100.00

The stock of coal on hand at tidewater shipping points, Dec. 31, 1886, was 372,282 tons; on Nov. 30, 393,202 tons, decrease, 20,920 tons. The amount on hand Dec. 31, 1885, was 754,545 tons.

The division of the output among the three great districts of the anthracite regions was as follows:

	1886.		1885		1884.	
	Tons.	P. c.	Tons.	P. c.	Tons.	P. c.
Wyoming.	17,031,826	53 0	16,236 470	51.3	15,716,455	51 1
Lehigh	5,723,129	17.8	5,898,634	18.7	5,562,226	18 1
Schuylkill...	9,381,409	29.2	9,488,426	30.0	9,478,314	30.8
Total.....32,136,363		100.0	31,623,530	100.0	30,756,995	100 0

The Wyoming Region continues to lead in growth, its proportion of the total output having increased steadily for several years past. Both the Lehigh and the Schuylkill districts last year show small decreases from 1885.

Eastern competitive tonnage, including all coal which for final consumption or in transit, reaches any point on the Hudson River or the bay of New York, or which passes out of the capes of the Delaware, was:

	1886.	1885.	1884.	1883.
Tons....	12,042,480	11,953,587	12,009,855	13,148,185
Per cent. of total.	37.4	37.8	39.1	41.4

This eastern competitive tonnage has shown for several years a steady decline, not in actual amount, but in the proportion which it bears to the total output.

Southern Railway Steamship Association.

The Board of Arbitration has given decisions in several cases recently before it, as follows:

1. Rates from both the East and the West to Rockmart, Ga., shall be the same as to Rome and Cedartown, from Feb. 1 next.

2. For September, 1885, the Louisville & Nashville is entitled to its share of the 3 per cent. allotted the Atlanta & West Point in the cotton business at Atlanta. From Oct. 1, 1885, to Sept. 1, 1886, the Louisville & Nashville and the Selma Division of the Western of Alabama are entitled, in the absence of any agreement to the contrary as to a division of such business at Montgomery, to a sub-division of the de-

ficit fund of the 3 per cent. in proportion to the cotton carried by their respective rail lines during the period specified.

3. That bar, band, boiler, sheet and plate iron or steel all unpacked, and cut nails and spikes in kegs, be made 60 per cent. of sixth class. Other iron manufactures to be made two-thirds of sixth class, or to remain as now classified. All articles named above, between what are known as Virginia points, and Augusta, Montgomery and Selma, shall take the Baltimore rates. This decision and award shall apply on business from all Eastern, Western and Southern points, including Birmingham, Briarfield, Chattanooga, Anniston, Rome and Knoxville.

Provision Exports via New Orleans.

It is stated that at a conference held last week at New Orleans, between representatives of the Kansas City packing houses and of the railroad and steamship lines, a through route was agreed upon from Kansas City to Liverpool over the Kansas City, Fort Scott and Memphis to New Orleans, and thence to Liverpool by Harrison line of steamers, which will enable the Kansas City packers to lay down their goods in Liverpool from 20 to 25 per cent. cheaper than by way of New York. Warehouse for storage purpose will be built at New Orleans by the steamer line.

It is said that Mr. Armour recently sent a large quantity of beef to Liverpool via New Orleans, and that it afforded better returns than similar shipments via New York.

Central Traffic Association.

The General Freight Agents of the trunk lines have met in Buffalo, N. Y., and the rates from Buffalo to Chicago and all points taking Chicago rates were prepared as follows: 50, 40, 30, 22½, 17½, 15 cents, being an advance of 5, 5, 5, 2½, 2½, 3, over present rates. The meeting is to be continued, and the figures further revised.

A meeting of the Passenger Agents of the west-bound roads, in the territory of the Central Traffic Association, was held in Buffalo, N. Y., in pursuance to a call issued by Commissioner Daniels, who was present, as was Commissioner Pierson, of the trunk line pool. The better maintenance of rates was the subject discussed. The withdrawal of all commissions was decided upon, and it was agreed to redeem all the tickets at tariff rates. The Buffalo, New York & Philadelphia road joined the Buffalo Passenger Committee, making a complete list of the west-bound roads.

Owing to serious complications that have arisen in the Central Traffic Association meeting at Chicago, it is not probable that that body can be amicably reorganized as an association to maintain rates within the provisions of the Interstate Commerce Bill. The trouble is over the Peoria pool, which has been in a bad condition for some months, the award of percentages being most unsatisfactory. At last Saturday's meeting the Chicago, Rock Island & Pacific gave notice of withdrawal from the pool, and announced that it would make no further reports, giving as its reason for this action the position taken by the Wabash, St. Louis & Pacific, and the Peoria, Decatur & Evansville, which was a refusal to even up percentages from Indianapolis. Commissioner Blanchard is in New York to lay the situation before the trunk line officials, but a good result is not anticipated.

Chicago Shipments Eastward.

The Board of Trade reports east-bound shipments from Chicago for the week ending Jan. 22 as follows, in tons:

	Tons.	P. c.		Tons.	P.c.
Chi. & Gd. Trunk	6,462	17.5	Pitts., Ft. W. & C.	6,461	17.5
Mich. Central	6,182	16.7	Chi., St. L. & Pitts.	2,918	8.0
Lake Shore	7,305	19.7	Balt. & Ohio	1,161	3.1
N. Y., Chi. & St. L.	2,712	7.3	C., Ind., St. L. & C.	3,771	10.2

The statement includes local as well as through shipments. The total for the week was 36,972 tons, being a decrease of 7,045 tons, or 16.0 per cent. from the preceding week, and the smallest shipments for eight weeks, with one exception.

Shipments for eight weeks past by these reports have been, in tons:

Week ending						
Dec. 4.	Dec. 11.	Dec. 18.	Dec. 25.	Jan. 1.	Jan. 8.	Jan. 15.	Jan. 22.
40,935	45,238	48,080	63,133	44,292	37,520	44,017	36,972

Shipments by the Chicago & Atlantic road are not included above. These shipments include dead freight only.

The Cotton Pool.

A Chicago dispatch of Jan. 26, says: The general freight agents of the various roads interested in the cotton traffic from Memphis and other Southern points to the East, held a meeting to-day at the office of Commissioner Blanchard, to bring about an arrangement for the maintenance of rates. Several meetings have heretofore been held, with a view to pooling the cotton traffic from Memphis and other points. They have all failed, owing to the refusal of the Chesapeake & Ohio to join a pool. After the last meeting, held in St. Louis, Commissioner Blanchard appealed to President Huntington, of the Chesapeake & Ohio, imploring him to join the pool, as otherwise it would not be possible to maintain profitable rates. Mr. Huntington, it is stated, replied that while his road would not join in the pool, it was perfectly willing to enter into an agreement with the other roads interested in that traffic for the maintenance of tariff rates. General Traffic Manager Miner, of the Chesapeake & Ohio, was present at the meeting to-day, and after a short discussion it was resolved to restore cotton rates from Memphis and other Southern points to tariff, and have them strictly maintained.

Ohio River Pool.

At a meeting of the Executive Committee of the Ohio River pool an agreement was reached on the division of percentages in what is known as the sixth pool. This latter governs all through business with lines south of the Ohio River, and the arrangement gives the lines from Chicago to Cincinnati and Louisville 54 per cent. of the traffic, and those to Cairo and Evansville 46 per cent. It was also agreed that the pool should be continued until the inter-state law went into effect, some future policy to be determined upon in the meantime.

RAILROAD LAW.

Proposed Railroad Legislative in New York.

The New York Railroad Commissioners have presented to the Senate at Albany a supplementary report, and submit ten new bills, as follows:

1. Providing that in case of merger or purchase of roads the capital of the new corporation shall not exceed that of the purchased road.

2. Prohibiting roads from crossing streets and highways at grade; also providing rules about crossings.

3. Prohibiting directors of railroads from bonding roads or increasing stock, except by vote of a majority of the stockholders.

4. Requiring more promptness and accuracy in railroad reports.

5. Prohibiting construction of roads except upon certificate of the commission that they are necessary.

6. Prohibiting the leasing or combining of parallel or competing lines.

7. Prohibiting rebates to shippers who agree not to ship freight by canal.

8. Making railroad companies responsible for damages by fire caused by locomotives.

9. Regulating in detail the transportation of explosives.

10. Requiring railroad companies to receive par value for first issues of bonds and stocks; also providing that franchises, charter rights and lease rights shall not be considered as property; also prohibiting mortgages in excess of capital stock.

OLD AND NEW ROADS.

Alabama Midland.—Articles of incorporation have been filed by this company, which proposes to build a road from Montgomery, Ala., to Troy, a distance of about 45 miles. At Troy it will connect with the Mobile & Girard.

Allegheny Valley.—The legal controversy between the bondholders of the Allegheny Valley road and the Pennsylvania Railroad Co. has been thrown back upon its merits for trial, free from cross-bills, demurrers, pleas and counter pleas, by several orders that have been handed down. The case is now in such shape that a Master can be appointed, which will probably be the next move of the court.

Arkansas City & Delhi.—This company has filed articles of incorporation at Little Rock, Ark., for a road to run from Arkansas City, Ark., to Delhi, La. It will be 130 miles long. The incorporators are New Jersey and New York men. Work has already begun.

Atchison, Topeka & Santa Fe.—The papers have been filed in the suit brought by Clarence H. Venner, of Boston, a stockholder in this company, to restrain its directors and officers from guaranteeing the bonds of a new road known as the Chicago, Santa Fe & California.

Atlantic & Danville.—It is reported that this road will be taken up by some Northern capitalists, and operated as a rival to the Norfolk & Western. As originally projected, the road was to run from Claremont, Va., to Danville, Va., 165 miles, and about 60 miles are now completed. The proposition now is to make Portsmouth, Va., the Eastern terminus instead of Claremont. The ultimate intention is to build through to Memphis, Tenn., practically paralleling the Norfolk & Western.

An election will be held in Southampton County, Va., next month, to vote on the proposition of subscribing $150,000 to the capital stock of this company. Several counties have already subscribed $650,000.

Baltimore & Ohio.—Suits have been begun against this company by sufferers of the Republic, O., disaster. The first was brought by Harry Forrester, of Chicago, for $5,000. The next is by Mrs. Postelthwaite, whose husband and two sons were killed, and the sum is $25,000.

Boston & Albany.—All the designs and plans for the new union depot, to be built at Springfield, Mass., have been handed in to the officers of the company. The stipulations were few, no limit being placed on the cost of the building. The structure will consist of solid granite masonry, with arched roof of iron and glass.

Boston & Maine.—This company, as lessee of the Worcester, Nashua & Rochester road, has appealed to the Supreme Court of New Hampshire from the valuation assessed against the latter in 1886 by the State Board of Equalization for the purposes of taxation.

Buffalo, Rochester & Pittsburgh.—The stations on this line, heretofore known as Climax and Bradford Junction have been changed to Ellmont and S. & B. Junction respectively.

This company will build a high signal station tower at Du Bois, Pa.

Canadian Pacific.—Arrangements are being perfected for the construction of the Algoma Branch of this road to Sault Ste. Marie, Mich. Mr. R. Rush has been given a contract to supply the timber for piling Echo River, 2,000 in number, 20 to 40 ft. long.

Central Massachusetts.—A Boston correspondent of the Springfield, Mass., *Republican*, describes the way in which this road will build an independent line to the connecting roads in New York state. "It is proposed to utilize the New Haven and Northampton road, which has already intimate relations with the Central, and to go northwest over the hills from Williamsburg. Now there is on file in the statehouse a map of a survey made for the Central in 1867 from Williamsburg to North Adams. A profile is also deposited with it which shows the steepest grade on any part of the line to be at the rate of 70 ft. to the mile. This is on the west side of Hoosac Mountain. On the east, just before reaching the crest, the grade is only 52 ft., but there is a place a little west of Williamsburg where it is 69 ft. Immediately on leaving Williamsburg this route of 1867 makes a large detour to the north and then turns westward. Its course then runs in a reasonably direct line to the northwest till it gets within the limits of Savoy. When it leaves Williamsburg (after the detour) it follows the general direction of the Goshen and Williamsburg road to Goshen. Then it runs northwest, then bears to the west till it strikes the valley of the Westfield River. Thence it goes to Cummington village. Gloyd's woolen mill is one of the places indicated by which the survey runs. West Cummington is the next place on the line, and then the road crosses a stream marked East Branch, where there is a paper mill. Crossing into the territory of Windsor, among the property-holders indicated there are Capt. J. Allen and A. Babbitt. The Savoy River is followed, and Savoy Hollow is reached. Then a sharp turn is made to the southwest. A cut is taken across the northwest corner of Windsor. R. Wolcott is a property-holder of the neighborhood. The Jackson road is crossed, and the survey passes over into Cheshire. Again a sharp change is made in the course of the road. It bears to the east of north, and then runs about due north, crossing the Thatcher road, where the Gulf road comes in near Cole's. A little further along is indicated the farm of D. F. Burlingame. After reaching the territory of Adams, the course of the survey is north and almost parallel with the North Adams & Pittsfield road northward of Adams. From the map it appears that the survey crosses the line of the former state road, up on the hills, a little east of the west portal of the tunnel. It keeps to the north as far as Bevar Bluff, and crosses the town line into Clarksburg. Then it makes a big loop, almost like a horseshoe, and turns southward and then westward, passing by North Adams to the north, a little distance. It strikes the line of the former state road again near where it crosses the Hoosac River, and there ends.

"A petition will be presented to the legislature, it is expected, by the Central people (not the Lowell), asking for a charter through this territory, for the old charter of 1867 has expired by limitation. The legislative report for to-day shows what the Lowell is doing to increase its terminal facilities."

Central, of New Jersey.—There is a rumor now current that the same persons who are now foremost in Philadelphia & Reading, who have obtained control of the Richmond Terminal and have bought the East Tennessee, Virginia & Georgia are making heavy purchases of Jersey Central stock, with a view of controlling the property.

Chicago, Burlington & Quincy.—The suit of this company against the Cleveland stockholders of the Kansas Rolling Mill Co. was begun last week in Cleveland, O. The railroad corporation asserts that in 1883 it was granted a judgment against the mill company of $57,934, no part of which has been paid. The petitioners aver that the property was mortgaged in 1879 to trustees to secure the issue of $100,000 of bonds, and that the company assigned in Jan., 1883, the trustees taking possession. Since then, it is alleged, the property has been sold to pay off the mortgage debt, and the Ohio men are said to be the only solvent stockholders. Suit is commenced, therefore, to render them individually liable for the indebtedness.

Chicago & Indiana Coal.—The extension of this road from the old terminus at Fair Oaks, Ind., northward to La Crosse, 26½ miles, on which tracklaying was completed about the end of the year, has been opened for business. The road is now 146 miles long, from La Crosse to Brazil. The extension gives it a connection with the Chicago & West Michigan and other lines, making a new outlet for the coal which comes from the southern end of the line.

Chicago, Madison & Northern.—Track on this new line of the Illinois Central is reported laid for 23 miles northward from Freeport, Ill. The work is progressing as fast as the weather will permit.

Chicago, Milwaukee & St. Paul.—The income bonds of 1886 are payable in currency and have a sinking fund of 4 per cent. beginning January, 1889, which is applicable to the purchase of bonds at 105; and if they are not purchased at that price they may be drawn and paid at 105. The bonds are convertible into common stock at par within 60 days after any dividend day. The company agrees at any time after Jan. 1, 1889, at the request of a majority of outstanding bonds, to execute a mortgage covering the company's line from Chicago to Kansas City, including the bridge over the Missouri River at Kansas City and terminal facilities in that city. If a second mortgage should be placed on any part of the company's road the property above named shall be secured for the benefit of income-bond holders.

The *Northwestern Lumberman* says: "The scheme of the Chicago, Milwaukee & St. Paul Co. for a line up the Wisconsin River Valley to Lake Superior, through the Gogebic mining region, is worthy of more than a passing notice. It is designed to be one of the more important lumber lines in Wisconsin. The intention is to build from Merrill, the present northern terminus of the Valley Division, to the mouth of the Tomahawk River, as early in the coming season as possible. There the company is constructing a dam and booming works, capable of handling 300,000,000 to 400,000,000 ft. of logs in a season. These are the works about which there is to be litigation, the Wisconsin River Improvement Co. being the complainant. From the mouth of the Tomahawk the road will be pushed on toward Lake Superior. From a point below Wausau a line will be built southeastward, to connect with the main line, so as to form a direct route to Milwaukee & Chicago, without making the circuit by way of Tomah; at least, this is the plan, as reported, and there is little doubt that this cut-off will be built at an early day, for it is essential to the value of the northern extension. Thus it will be seen that the Chicago, Milwaukee & St. Paul system will have a trunk line through the very heart of the richest log and lumber section of Wisconsin, and will be able to rake down the valley, and take in every important mill point on the river. By throwing out branches and spurs into the upper portion of Lincoln County, an immense log traffic can be built up. It will be noticed that this road will be a lumber feeder for Milwaukee and Chicago of great importance."

Chicago, Santa Fe & California.—The contractors for the construction of the extension of the Atchison, Topeka & Santa Fe system between Kansas City and the Mississippi River are the following: McArthur Bros., St. Paul, for the 60 miles west of Fort Madison, Ia.; Miller, Loomis & Gill, Chicago, the next 40 miles; Williams, McRitchie & J. H. Hampson, Leavenworth, for 60 miles, covering the entire distance west of the Mississippi River. The contracts call for their completion by Nov. 1, 1887.

This company has issued $15,000,000 first mortgage gold 5 per cent. bonds, guaranteed by the Atchison, Topeka & Santa Fe, for the purpose of constructing a road between Chicago and Kansas City, Mo., to connect with the Atchison, Topeka & Santa Fe system. The issue is simultaneous in New York, Boston and London.

Chicago, Springfield & St. Louis.—N. B. Wade and Warner M. Hopkins have filed a bill in equity at Springfield, Ill., against this company. They are holders of 50 bonds of $1,000 each, issued for the construction of the road by the Central Trust Co. of New York, and delivered by the Empire Construction Co. of New York. It seems that the latter secured right of way and began to build. Then new parties organized another company, under the laws of Illinois, and obtained all the property and right of way originally belonging to the above company, claiming that the lien of the original deed of trust acquired by that company no longer exists. The complainants now ask for an account of the bonds and coupons secured by the original deed of trust and of the amount due thereon, and that they may have further relief.

Cincinnati, Hamilton & Dayton.—On Feb. 1 the Baltimore & Ohio Express Co. will succeed the United States Express Co. in the business over this system.

Columbus, Hocking Valley & Toledo.—President Shaw, of this company, has recovered $946,000 of missing securities from Ex-Judge Stevenson Burke, formerly president of the company, and from Directors Hickox and McKinnie, who were members of the executive committee under the Burke management. Among the assets recovered were $622,000 of the general mortgage bonds and $50,000 in cash, the proceeds of the $61,000 old 7 per cent. bonds sold by the former president and not accounted for. The remaining 60 bonds of the $121,000 of this issue were found to be in the possession of Director Hickox. There were also recovered $200,000 in preferred stock, about the issue of which none of the present directors had any previous knowledge. Several years ago an issue of $600,000 preferred stock was authorized, but the books do not show that any of it was issued. For some reason the project was abandoned and shortly afterwards a new mortgage was made on which the necessary money was raised. It appears, however, that President Burke used $200,000 of this authorized preferred stock. The whole amount is recovered and will be cancelled at once. With the exception of the Hickox loan it is supposed by the new management that the restitution is complete. Nothing of what has been done affects any claim connected with the issue of securities in the consolidation of 1881.

Judge Burke, on the other hand, says that the bonds were placed in his hands to be used as collateral security to enable the company to get through its embarrassment and to carry an indebtedness caused by making improvements. He claims that President Shaw came to him and obtained a general statement of bonds and money in hand, and finally the

bonds were turned over to him, he, Mr. Shaw, giving security for payment of the indebtedness to the Snow Fork & Cleveland Coal Co., the Continental Coal Co, Mr. Hickox and Judge Burke.

Official denial has been made of the reports which have been current to the effect that there has been a defalcation in this company, and that an over-issue of bonds has been discovered. It is stated that there is no foundation for either report

Columbus, Sandusky, Indianapolis & Western.—It is expected that the Indiana, Bloomington & Western, the Cleveland, Sandusky & Cincinnati, and the Springfield & Columbus, will be consolidated and operated under the above name. The line will include 584 miles of road, extending from Peoria, Ill., to Sandusky, and from Columbus to Peoria.

Cumberland & Ohio.—Just after the war, Allen County, Ky., subscribed to the capital stock of this road. The road was never built, and the county refused to pay the subscription, pleading poverty. Mr. Theodore W. Thompson, of Illinois, has just filed suit at Louisville, Ky., for $51,160 against the county, in order to recover this old debt.

Danville, Paxton & Mendota.—Right of way is reported to have been obtained for this road in Illinois, and construction work will begin in the spring. The road will be run in the interest of the Danville coal industry.

Delaware & Hudson Canal.—This company will, it is said, build a branch road from Honesdale, Wayne County, Pa., to Canton, Bradford County, where it will connect with the Northern Central. The object is to open up the coal regions of that section.

Denver, Boulder & National Park.—This company has filed articles of incorporation at Denver, Col. Capital stock $1,000,000. The road is to be narrow gauge, running from Denver to Middle Park, Col. Office at Denver.

Denver & Rio Grande.—The new extension from Red Cliff, Col., by Glenwood Springs to Aspen will be 1.30 miles long, and the branch from Montrose to Ouray will be 31 miles long. To pay for these new lines will require the issue of first consolidated 4s now in the treasury to the amount of $20,000 per mile, as provided for in the mortgage. Holders of preferred stock have been asked to approve this issue.

Drummond & Phillipsburg.—This company has been organized at Helena, Montana, to build a road from Drummond, Montana, to Phillipsburg, a distance of 25 miles. Surveys are now being made and the road is expected to be completed by July 1, 1887.

Duluth, St. Cloud, Mankato & Southern.—This company has been organized in Minnesota for the purpose of building a line from Duluth through St. Cloud, Litchfield, Mankato, Alma City, New Richland and Geneva, Minn., to Austin, and another branch from Alma City through Freeborn and Albert Lea to the state line at the south. The company as now organized is a combination of the Austin, Geneva & Mankato, the Mankato & Albert Lea, and the St. Cloud & Southern. Capital, $6,000,000.

Elmira, Cortland & Northern.—An extension of this road will be made the coming summer to Carthage, N. Y., in order to secure a part of the traffic of the Adirondack iron mines.

Fitchburg.—The stockholders have voted to confirm all of the previous votes of the stockholders authorizing the issue of new stock and to ratify and confirm the purchase of the capital stock of the Ashburnham Railroad Co., a road from Ashburnham to South Ashburnham, Mass. The agreement for the consolidation of the company with the Troy & Greenfield and the Hoosac Tunnel was confirmed. The Massachusetts Legislature will be petitioned to provide that the Governor have authority to appoint 3 directors to represent the Commonwealth on the Fitchburg board. Also that the Legislature shall exempt the consolidated company from executing a mortgage to secure its bonded and other indebtedness.

It is rumored that the negotiations between this company and the Troy & Boston for a consolidation of the two lines are off. It is said that the holders of a large block of the securities of the latter company refuse to sell at the figures originally agreed upon, and the Fitchburg people are not willing to raise their offer.

Fort Scott, Natchez & New Orleans.—This company has filed articles of incorporation in Helena, Ark. The road runs from a point on the Missouri state line to Springdale, Ark. Capital stock $200,000.

Gainesville, Henrietta & Western.—Contracts have been let for the construction of 11 section houses and 6 depot buildings on this road. The directors of the company have passed a resolution to bond the road for $20,000 a mile for 140 miles.

Georgia, Carolina & Northern.—Two corps of engineers will leave Athens, Ga., this week, one going toward Atlanta, and the other in the direction of Elberton, Ga., to survey this road.

Gulf, Colorado & Santa Fe.—Grading is continually progressing on this line between Paris, Tex., and Ledonia, and tracklaying will begin this week. The track will be completed to Paris by March 1.

Hecla & Torch Lake.—The round-house belonging to this road at Calumet, Mich., was burned last week and 5 locomotives were consumed. Loss estimated at $75,000.

Houston & Texas Central.—Contracts for building this company's new depot at Houston Tex., have been awarded as follows: Barnes & Palliser, Galveston, Tex., brick work; A. C. Moune, Houston, carpenter work; C. Redding & Co., Galveston, galvanized iron and tin work; Paul Shearne, Galveston, plumbing and steam-fitting; Edward Brown, Houston, slating; W. H. Lock, Houston, painting. The structure will cost about $100,000.

Hudson's Bay Road.—Mr. Hugh Sutherland, President of this company, whose road runs from Winnipeg, Manitoba, to Hudson's Bay, announces that the company intends to spend $4,000,000 the coming year in construction. The company is having three ships built at Newcastle-on-Tyne for the Hudson's Bay route. Ten locomotives and rails for 200 miles of road are also being constructed. He says that two years will see the road completed.

Huntingdon & Broad Top.—This company has made arrangements with the Pennsylvania for 400 additional coal cars, which it is believed will be required for its next year's coal trade, which will be largely augmented by the completion of the Piedmont & Cumberland road in about two months from now. The traffic of this road passes over the Huntingdon & Broad Top.

Illinois Central.—It is reported that this company has secured a majorityof the stock of the Dubuque & Sioux City road. The present lease of that road to the Illinois Central expires next summer, and a strong effort has been made by the owners either to compel the Central to lease the road again at the high rate it has thus far paid or to give it up so that it could be leased to other parties.

Kansas Valley.—This company has been incorporated at Topeka, Kan., and will build a road from a point near Kansas City west along the valley of Kansas to the western boundary of the state and from thence to Denver, Col. It will be operated in conjunction with another new road, to be known as the Topeka, Blue Valley & Northwestern. Capital stock, $10,000,000.

Lake Erie, Alliance & Southern.—Articles of incorporation have been filed at Columbus, O., by this company. It will succeed to the property of the Cleveland, Youngstown & Pittsburgh, and in addition to the 60 miles of road now in operation, it is intended to extend the line to Fairport Harbor, O., on the north and Steubenville on the south.

Lake Erie & Western.—At the close of business on Jan. 22, when the time expired for depositing securities for the reorganization of this company, the following had been received by the Central Trust Company: 75,000 shares of stock out of a total issue of 77,200 shares; $989,000 of Lafayette, Bloomington & Muncie income bonds out of a total issue of $1,000,000; $1,479,000 of Lake Erie & Western incomes out of a total of $1,485,000; $500,000 Sandusky division bonds out of a total of $580,000, and all the first mortgage bonds of all the divisions. The foreclosure sale having been confirmed, this large deposit of securities under the plan issued by Gen. Thomas and Mr. Nelson Robinson insures the reorganization of the company accordingly. Mr. Thomas gave notice to first mortgage bondholders to present their bonds on Jan. 25 at the Central Trust Co. in New York and receive payment in full.

All the material has been purchased for the proposed extension of this road from Bloomington, Ill., to Peoria, and work will probably begin early next summer.

Lake Geneva & Pacific.—This company has been incorporated at Madison, Wis., for the purpose of building a road from Lake Geneva to Portage, Wis., a distance of 110 miles.

Lehigh Valley.—It is reported that this company will extend its Hazelton & Freeland branch to White Haven, Pa. This will shorten the distance from Hazelton to Wilkes-Barre 40 miles, and will also connect with the Delano Branch of the road.

Long Island Elevated.—A petition has been presented to the Brooklyn Aldermen, with about 1,000 signatures, asking that consent be granted to this company to construct its road in Atlantic avenue, Brooklyn, so that the steam railroad can be removed from its surface. The matter was referred to the Railroad Committee, before which the application of the company for a franchise has been pending for many months.

Louisville, Evansville & St. Louis.—Parties entitled to securities of this company, as reorganized, are dissatisfied because the securities due in October, 1886, are not forthcoming. These consist of first and second mortgage bonds and preferred stock. There are charges of underhand work, though whether they have any foundation in fact is not certain.

Louisville, New Albany & Chicago.—Work on the Orleans, Paoli & French Lick Branch of this Indiana road is progressing, 4 miles being graded between Paoli, Ind., and French Lick, while the line from Orleans to Paoli has been completed for some time. The contract for the road between French Lick, Ind., and Jasper will be let next month.

Macon & Tuskaloosa.—This company has been organized in Mississippi. A committee is negotiating for land donations and right of way, and it is said that surveys will be made soon.

Memphis & Little Rock.—In the case of this company, as reorganized, against Robert K. Dow, Watson Mathews and Charles Moran, trustees under a mortgage executed in 1877 by the company to secure its bonds amounting to $2,600,000, a decision has been made by the United States Supreme Court. At the time of the execution of the mortgage the state of Arkansas had a statutory lien upon the mortgaged property for a loan of $100,000 with 8 per cent. interest made to the old company. The state, in a suit to which the new company was a part, got a decree enforcing its lien and ordering the property to be sold. Dow and his associate trustees paid off the state's claim, in order to protect the mortgaged property from a forced sale. The amount paid was $251,456. They then brought this suit to be subrogated to the lien of the state under the decree. The present company resisted the claim on the ground that the $2,600,000 of the bonds issued by it were void under the state constitution. The Supreme Court upholds the validity of the bonds and allows $29,000 for costs and expenses incurred by trustees. But the decree is reversed so far as it allows 8 per cent. interest on the sum paid by the latter to lift the state's claim, and says that 6 per cent. is all that should be paid, that rate being prescribed by the local law.

Missoula & Bitter Root Valley.—This company has been organized at Helena, Montana, to build a line of road from Missoula, Montana, 80 miles into Bitter Root Valley. Surveys are now being made.

Missouri Pacific.—Under the condition of Mr. Jay Gould obtaining control of the Memphis & Little Rock, which now seems probable, it is said that he will gain some sort of connection with Newport News, Va., thereby having an Atlantic seaport for the Missouri Pacific system. The Arkansas Valley road is likely to be extended to New Orleans. This gives the Gould roads two outlets to the seaboard.

Montreal, Portland & Boston.—At a meeting of the stockholders last week two different boards of directors were elected by rival factions. The dispute will be taken to the courts.

New York Central & Hudson River.—There is a great demand in Northern New York for a new road that will spoil the monopoly now held over that section by the Rome, Watertown & Ogdensburg. Many different schemes have been concocted by the merchants, manufacturers and business men, and it now appears that inducements have been offered to the New York Central & Hudson River Co. to build a road. It is reported that this will be done, and that work will commence within 8 months. It is intended that the road shall pass through St. Lawrence, Hamilton, Essex, Warren, Saratoga and Schenectady counties, so as to connect with the company's main line at Schenectady, N. Y., also at South Schenectady with the West Shore. A further connection can be made with the Canadian Pacific, which will probably be done. In this way the New York Central & Hudson River will get the summer travel to the Thousand Islands.

New York & Massachusetts.—This is the name by which the Poughkeepsie, Hartford & Boston will be hereafter known. The road extends from Poughkeepsie, N. Y., to Boston Corners on the Harlem road, a distance of 37 miles. Plans are under consideration for its extension eastward to a connection with the Central Massachusetts road.

Norfolk & Western.—The Chief Engineer of this road has been ordered to immediately make the necessary survey for a line to connect the road with the Cincinnati, New Orleans & Texas. Engineers have started work at Bristol, Tenn. About 140 miles of new road will be required.

Northern Central.—The statement for December and the year to Dec. 31 is as follows:

	December.		Year.	
	1886.	1885.	1886.	1885.
Earnings	$457,809	$507,699	$5,474,617	$5,490,922
Expenses	294,305	286,445	3,542,668	3,255,614
Net earnings	$163,504	$221,254	$1,931,949	$2,235,308

For the year the gross earnings decreased $16,305, or 0.3 per cent., and the expenses increased $287,054, or 8.8 per cent., leaving a decrease of $303,359, or 13.6 per cent., in the net earnings.

Northern Pacific.—In a suit of the United States against this company for $1,100,000, alleged to be due for timber cut and removed by defendant from plaintiff's land in Missoula County, Minn., the Judge has decided in favor of the company.

Ohio River.—A. J. Jolly & Sons, of Pittsburgh, Pa., have been given the contract for the proposed extension of this road from Point Pleasant to Huntington, Va. The contract includes the erection of a large bridge across the Big Kanawha River. The foundations for the river piers will be sunk on the new process, by means of compressed air in iron casings. The entire height of piers will be 128 ft., 90 ft. above and 38 ft. below low-water mark. The approach on one side will be 2,200 ft., and on the other 2,100 ft., making in all more than one mile of iron work.

Oregon Pacific.—This company's bridge over the Willamette River at Albany, Oregon, was recently opened. The bridge proper is a Howe truss, composed of two stationary spans of 175 ft. each, and a draw span in the middle of 260 ft. The piers are made of piles driven 15 ft. in the blue clay bed of the river, surrounded by cribs of timber and filled in with rock. The pivot pier is protected by long extensions at right angles with the bridge, the bridge itself being directly at right angles with the course of the stream. The draw channels are 112 ft. wide at either side in the clear. The structure is of wood and iron. The draw, designed by Coolidge & Co., of Chicago, formerly American Bridge Co., can be shifted by two men with ease. The western approach is half a mile long, the eastern 1,500 ft., and 1,100 piles are used in the structure.

Oregon & Transcontinental.—A statement of the assets and liabilities of this company on Jan. 10, 1887, has been issued. It shows total assets of $22,873,193, liabilities $7,137,500, net assets $15,735,693. The details vary but little from those published in May last.

Peoria & Joliet.—This company has been incorporated in Illinois, and will build a road from Peoria to Joliet, a distance of about 110 miles. Principal offices at Springfield, Ill. Capital stock, $2,000,000.

Philadelphia & Reading.—A bill in equity, asking for the appointment of receivers for the Schuylkill Navigation Co., one of this railroad company's leased properties, has been filed, and the request granted, in the United States Court, at Philadelphia. Frederick Fariey, President of the Schuylkill Navigation Co., and W. M. Tilghman were appointed. It was done on the application of holders of $32,000 of the Schuylkill Navigation Co.'s 6 per cent. loan of Jan. 1907. The suit is an amicable one for the purpose of protecting the various interests of the corporation, pending the reorganization of the Philadelphia & Reading.

A full meeting of the committee of this company's general and income mortgage bondholders to consider a plan of reorganization has been held in Philadelphia, but the plan is not yet issued. Appeals from the Master's report on the foreclosure of the property will be made by both the income and general mortgage holders. The latter appeal upon the general mortgage script. The Receivers still retain their policy to pay no interest that has not been earned. Efforts are being made to hasten action upon their petition to the court for permission to create a car trust for $1,250,000, as the road is in great need of equipment.

Philadelphia, Wilmington & Baltimore.—A double track will be laid over the Delaware Division of this road. The work on the new line will begin with spring, the engineers now being engaged in their surveys. It is expected to be finished to Clayton by June, and to Wilmington, Del., 51 miles, by the close of the summer.

Phœnix & Maricopa.—Information has been sent to Washington from the Indian Agent at Casa Grande, Arizona, to the effect that this company was grading a line of road through the Gila River Indian Reservation without having first obtained the consent of the Indians, contrary to the provisions of the act granting them the right of way. The communication was referred to the Secretary of the Interior, and word was at once sent back that all "work must cease till the consent of the Indians in council was obtained." If the order is not complied with the military will be called upon.

Piedmont & Cumberland.—The people of Cumberland, Md., appointed a committee some time ago to ascertain whether this road, in entering the city, did not obstruct the Chesapeake & Ohio Canal. The committee has made its report, stating such to be the case. The report concludes:

"In view of the great interest which the people of Cumberland feel in maintaining the corporate existence of the Chesapeake & Ohio Canal as an independent line of transportation, and especially in view of the growing conviction that insidious efforts are being covertly made to absorb it upon the part of certain railroad interests, and the more painful conviction that the present management of the canal appears to be in apparent accord with this scheme of absorption, your committee begs leave to recommend that a public meeting of the citizens of Cumberland be held at an early day for the purpose of giving expression to a public sentiment concerning the critical condition of Maryland's great water-way, and for the further purpose of devising some plan by which its future existence as an independent highway can be secured."

Put-in Bay, Port Clinton & Southern.—This company has been organized by citizens of Ottawa County, Ohio, for the purpose of building a road from Ottawa City to a point on the Wheeling & Lake Erie or the Lake Shore & Michigan Southern.

Republican Valley & Wyoming.—This newly incorporated company proposes to build a road from a point on the Omaha & Republican Valley road near Culbertson, Hitchcock County, Nebraska, northwest through Hayes and Chase counties to a point on the line between Nebraska and Colorado. Capital stock, $1,400,000.

Richmond & Alleghany.—A circular recently issued by the committee to those who signed the agreement of reorganization said that by reason of the insufficient earnings of the road they were unable to see how the agreement for reorganization could be carried out and the interest on the proposed new first mortgage bonds paid on the first day of July next. The aggregate of receivers' certificates is $493,717;

car trust certificates, $376,000, and other liens, $157,000, making in all $1,026,717, an amount involving an annual first charge of about $60,000. The committee earnestly recommends that the existing agreement for reorganization shall be modified as follows: 1. The new first mortgage bonds shall be issued minus coupons for the years 1887 and 1888. 2. For the coupons so withheld, holders of said bonds shall receive an equal amount of the preferred stock of the new company; and to provide for the same an assessment of 10 per cent. in kind upon the entire amount of the new preferred stock shall be made and become a part of the said agreement. The assessment already paid to the committee by the holders of the old common stock is to be applied as provided for in the existing agreement. Whatever may be the net earnings of the reorganized road for the years 1887 and 1888 will be applicable and applied to the extinguishment of receivers' certificates and other prior indebtedness. On the basis of present earnings, those of 1887 and 1888 will probably pay about $300,000 of receivers' certificates and make the $990,000 of preferred stock, which will be in the treasury of the company, an available asset.

Under this alteration and amendment, the preferred stock of the reorganized, company will be issued as follows: To holders of old first mortgage bonds, 37 per cent, or $1,850,000; to holders of old second mortgage bonds, 43.2 per cent., or $2,160,000; leaving in the treasury, 19.8 per cent., or $990,000, making the total $5,000,000.

Richmond & West Point Terminal.—The collateral trust loan of $8,500,000 from which this company will make its cash payment of $4,400,000 for the control of the East Tennessee, Virginia & Georgia, has been taken by the First National Bank of New York, in behalf of a syndicate comprising Messrs. Calvin S. Brice, Samuel Thomas, John H. Inman, John D. Rockfeller, Geo. S. Scott, Moore & Schley, and others.

Rome & Carthage.—It is proposed to build a road by this name from Rome, N. Y., to Carthage, a distance of about 54 miles. It is to pass through Oneida, Jefferson and Lewis counties. A meeting has been held at Rome to discuss the feasibility of the plan. The line will parallel the Rome, Watertown & Ogdensburg to some extent.

Rome, Watertown & Ogdensburg.—The sum of $23,127 has been levied on the real estate in the town of Lewiston, N. Y., to pay judgments obtained against this company on old bonds.

San Antonio & Aransas Pass.—The Waco branch of this company will be completed to Cuero, DeWitt County, Texas, 105 miles from San Antonio and 42 miles east of Kennedy Junction, by Jan. 28, 1887.

St. Louis & St. Joseph.—This company has filed suit for $400,000 at St. Louis against the St. Louis, Iron Mountain & Southern and the Missouri Pacific. In 1874 this road was leased to the St. Louis, Kansas City & Northern, which company consolidated with the Wabash, St. Louis & Pacific in 1879. In 1883 a lease was effected between the latter company and the St. Louis, Iron Mountain & Southern, and under that leasehold arrangement it is alleged that the Missouri Pacific operated the St. Joseph & St. Louis. It is claimed, however, that no rental has been paid. Last year the St. Joseph and St. Louis Co. recovered possession of the road, and now sues for the sum named, claiming that the leasehold agreement was completely violated.

St. Louis & San Francisco.—It is said that this road will be extended from Salem, Mo., to Little Rock, Ark., a distance of 300 miles. The new line will run through Dent, Shannon, Carter and Oregon counties, Mo., and through Randolph, Lawrence, Sharp, Independence, Cleburne and Faulkner counties in Arkansas. The Arkansas River will be bridged at Lewisville.

Seattle, Lake Shore & Eastern.—This company has three surveying parties in the field east of Seattle, Washington Territory. They are running lines between Squak and the Snoqualmie Pass.

Shenango & Allegheny.—It is reported that this road will be extended from Greenville, Pa., to Jamestown. At Greenville the road connects with the New York, Pennsylvania & Ohio and the Erie & Pittsburgh. By an extension to Jamestown a connection will be made with the Lake Shore & Michigan Southern

South Carolina.—This company has contracted for the transportation of iron from Birmingham, Ala., and Chattanooga, Tenn. At present the shipments per week will consist of from 500 to 1,000 tons of pig iron. It will be conveyed first to Charleston, S. C., from which place it will be shipped to New York by the Clyde steamers.

South Pittsburgh & Sequatchie Mineral & Railroad Co.—This company has been incorporated in Tennessee to build a road from South Pittsburgh, on the Tennessee River, to a point of intersection with the Cincinnati Southern at or near Kismet, a distance of about 100 miles.

Terre Haute & Peoria.—This company has been organized by the bondholders of the Illinois Midland to take possession of that road, which was recently sold under foreclosure. The road extends from Terre Haute, Ind., to Peoria, Ill., 176 miles.

Texas & Pacific.—Mr. Samuel Dickson, of Philadelphia, who is representing the trustees of the first mortgage bonds of this company, has filed a petition at New Orleans, La., asking that the Receivers of the road should pay the interest secured by said mortgage. The interest said to be due amounts to $3,784,000 arrearages. The proceedings in the case are of an amicable nature, approved by the Committee of Reorganization.

Toledo, St. Louis & Kansas City.—This company's bridge across the Wabash River near Bluffton, Ind., has been so badly damaged by ice that no trains can pass over at present.

Texas, Santa Fe & Northern.—This road, which was reported complete some two months ago, and which then had its time-table published in the *Official Guide*, was not actually completed until Jan. 9, when the last rail was laid, 4 miles of track having been laid this year. It extends from Santa Fe, N. M., to Española, the southern terminus of the Denver & Rio Grande's New Mexico Division, a distance of 38 miles; it it of 3 ft. gauge.

Topeka, Blue Valley & Northwestern.—The newly organized company proposes to construct a road from Topeka, Kan., to a point in Cheyenne County, with a branch from a point in Waubunsee County to Clay Centre, Kan. It will be under the same management as another new road, known as the Kansas Valley. Capital stock, $10,000,000.

Wabash, St. Louis & Pacific.—Members of the eastbound freight committee at St. Louis assert that this road has had an arrangement with the grain dealing firm of Reynold Bros., of Toledo, whereby they secured rates which debarred small dealers and elevators from competing with them. The other lines in the committee brought up the matter at a meeting of the East-Bound Committee, and the result was that this company flatly refused to permit this particular business to be included as through traffic. Thus does the matter at present.

Messrs. Humphreys and Tutt, Receivers of this system west of the Mississippi River, have tendered to Judge Cooley the control of the Eel River road, which runs between Detroit and Butler, Mich. Judge Cooley has refused to accept it, saying: "I do not think it for the interest of the trust I now represent that I accept the tender, and I must, therefore, decline it." Judge Cooley thinks it very doubtful if the Eel River road by itself could earn enough to pay expenses and keep itself in shape.

ANNUAL REPORTS.

Fitchburg.

This company owns a line from Boston to Fitchburg, 50 miles, with 47.57 miles of branches, and the Worcester Division, from Winchendon to Worcester, 36 miles. It leases the Vermont & Massachusetts, Fitchburg to Greenfield, 56 miles, with one branch, 2.80 miles. It also runs trains over the Troy & Greenfield road, Greenfield to North Adams, 37 miles, paying tolls for its use to the state. This makes the total main line, from Boston to North Adams, 143 miles long and the total mileage worked 229.37 miles. The report is for the year ending Sept. 30.

The company had $5,286,600 capital stock and $5,140,600 bonds. These amounts will be materially changed by the consolidation with the Troy & Greenfield, already noted.

Revenue trains last year ran 2,440,513 miles (locomotives 3,200,106 miles), carrying 4,130,395 passengers 61,073,787 miles, and 2,509,131 tons of freight 195,113,082 miles.

The average rate per passenger-mile was 1.75 cents. The average rate per ton-mile was: Local, 2.53; through, 0.81; average, 1.07 cents. The rates in 1885 were 1.83 cents per passenger-mile, and 1.07 cents per ton-mile.

Last year 3,323 tons of steel rails were used in renewals. A brick freight house was built in Worcester. Five new locomotives were bought. The double track has been nearly completed and the grade crossing of the Connecticut River road at Greenfield done away with.

The earnings for the year were as follows:

	1885-86.	1884-85.	Increase.	P.c.
Earnings	$3,399,542	$2,891,251	$508,291	17.6
Expenses	2,559,665	2,1.6,961	412,704	19.2
Net earnings	$839,877	$744,290	$95.587	12.8
Gross earn. per mile	14,821	13.768	1 053	7.6
Net " " "	3 662	3.544	118	3 4
Per cent. of expenses	75.3	74.3	1.0	....

Interest payments amounted to $260,763; rentals, $256,480; dividends (5 per cent.), $264,330; a total of $781,573, leaving a surplus of $58,304 for the year.

The report says: "The business of the Worcester Division (formerly the Boston, Barre & Gardner road) has been very satisfactory and fully justifies our action in its absorption.

"There has been an increase of unfunded debt. This is accounted for by the expenditure of $483,270 for construction purposes, and an increase in cash assets of $517,801.

"The burden of carrying the Boston terminal increases with the growth of business. There is at all times a large balance of money due from connections and customers for charges and advances on freight from the West, while at the same time the roads west of us require us to advance such charges before we can collect in Boston. This fact renders it necessary that we have a large working capital.

"We congratulate the stockholders that our negotiations with the Governor and Council have resulted in an agreement for consolidation of the Troy & Greenfield Railroad and Hoosac Tunnel with the Fitchburg Railroad. This we consider of the first importance to the company."

Des Moines & Fort Dodge.

This company owns a line from Des Moines, Ia., to Fort Dodge, 87 miles, with a branch from Tara to Ruthven, 56 miles. The report is for the year ending Dec. 31.

The company has $758,280 preferred and $4,283,000 common stock. The funded debt includes $1,200,000 firsts, $672,000 extension bonds, $1,200 incomes and $75,666 land certificates.

The earnings for the year were as follows:

	1886.	1885.	Inc. or Dec.	P.c.
Earnings	$338,610	$382,420	D. $42.810	11.2
Expenses	252,215	262.001	D. 9,786	3.7
Net earnings	$87,395	$120.419	D $33.024	27.5
Gross earn. per m.	2,375	2,674	D. 299	11.2
Net " "	611	842	D. 231	27.5
Per cent. of exps.	74.3	68.5	I. 5.8	....

Interest on the firsts and extension bonds amounts to $112,320. For some time past only half the interest has been paid in cash. A lease to the Chicago, Rock Island & Pacific Co. is under consideration.

Northern, of New Jersey.

This company owns a line from Bergen, N. J., to Nyack, N. Y., 25.7 miles; its trains run over the Erie track from Bergen to Jersey City, 2.3 miles, making 28 miles in all. The New York, Lake Erie & Western Co. furnishes train service under contract. The report is for the year ending Sept. 30.

The company has $1,000,000 capital stock. The funded debt includes $152,000 first 6s, $200,000 second 7s, and $157,500 Nyack & Northern 7s.

The earnings for the year were as follows:

	1885-86.	1884 85	Inc. or Dec.	P. c
Earnings	$322,216	$307.628	I. $14,588	4.8
Expenses	241,806	226.010	I. 15,796	7.0
Net earnings	$80,410	$81 618	D. $1,208	1.5
Gross earn. per mile	11.503	10,987	I. 521	4.8
Net " " "	2,872	2,915	D. 43	1.5
Per cent. of exps.	75.0	73.5	I. 1.5	...

Other receipts were $8,593, making the total income $89,003. Fixed charges were $39,265; sinking fund, $10,000; dividends (4 per cent.), $40,000; a total of $89,265. The surplus Sept. 30, 1885, was $20,914, which was reduced to $20,652 on Sept. 30 last.

Wilmington & Weldon.

This company owns a line from Weldon, N. C., to Wilmington, 161 miles, with 59 miles of branches, making 220 miles in all. The report is for the year ending Sept. 30.

The company completed a branch from Wilson to Fayetteville, 74 miles, last year, but it was not opened until after the close of the year.

It also controls the Albemarle & Raleigh, from Tarboro to Williamstown, 33 miles, but its earnings are not included below.

The company also leases the Wilmington, Columbia & Augusta road, from Wilmington to Columbia, S. C., 189 miles. The earnings of that line are reported separately and not included in the figures given below.

The company has $2,500,000 capital stock. Its funded debt includes $1,157,400 old 7s, and $1,336,000 general mortgage 5s.

The earnings for the year were as follows:

	1885-86.	1884-85.	Inc. or Dec.	P. c.
Earnings	$861.640	$824,957	I. $36,683	4.3
Expenses	487,540	451,816	I. 35,724	7.9
Net earnings	$374,100	$373,141	I· $959	0.3
Gross earnings per mile	3,917	4,166	D. 249	5,9
Net " " "	1,700	1,884	D. 184	9 8
Per cent. of expenses	56.6	54.7	I. 1.9	...

Interest and dividends (8 per cent.) amounted to $338,352, leaving a surplus of $35,748 for the year. The company received $353,670 for stock sold and $885,000 for bonds sold. Payments for new construction on the Fayetteville and Nashville branches amounted to $694,715.

The Albemarle & Raleigh road for ten months ending Sept. 30 earned $5,055 net. Interest on the bonds was $32,000, showing a deficit of $26,945 for the year.

Mobile & Ohio.

This company owns a main line from Mobile, Ala., to East Cairo, Ky., 493 miles; the Columbus Branch, 14 miles; the Starkville Branch, 11; the Aberdeen Branch, 9 miles, a total of 527 miles. From Feb. 1, 1886, it leases the St. Louis & Cairo road, Cairo, Ill., to East St. Louis, 151.6, with a branch 9 miles long. From Dec. 1, 1885, the Columbus and Starkville branches have been leased to the Georgia Pacific Co. The report is for the year ending June 30.

The company has $5,320,600 capital stock. The funded debt includes $7,000,000 first 6s., $1,000,000 extension 6s., and $10,000 wharf bonds. There are also $5,300,000 first, $1,850,000 second, $600,000 third and $900,000 fourth-preferred debentures, interest on which is contingent on earnings. This does not include $334,300 car trust notes.

The earnings for the year were as follows:

	1885-86.	1884-85.	Inc. or Dec.	P. c.
Earnings	$2,079,189	$2,101,026	D. $21,837	1.0
Expenses	1,552,266	1,574,727	D. 22,461	1,4
Net earnings	$526,923	$526,299	I. $624	0.1
Gross earn. per mile	3.585	3,987	D. 402	10 1
Net " " "	909	999	D. 90	9.0
Per cent. of exps	74.7	75.0	D. 0.3	....

Interest on bonds amounted to $481,600, and rental of St. Louis & Cairo road to $38,637; a total of $520,237, leaving a balance of $6,686 for the year. No interest, therefore, was paid on the debentures. Taxes are included in expenses.

New York, Providence & Boston.

This company owns a line from Providence, R. I., to Groton, Conn., 62½ miles; the Warwick Branch, 9¼ miles, and the Pontiac Branch, 5 miles. It leases the Pawtuxet Valley road, 5¾ miles, making 77¾ miles owned and 83 miles worked. The report is for the year ending Sept. 30.

The company owns a controlling interest in the Providence & Stonington Steamship Co., whose lines run from Providence, Stonington and Groton to New York.

The company has $3,000,000 capital stock and $1,300,000 funded debt, including $1,000,000 first 7s and $300,000 Extension 4s. It pays interest also on $100,000 Pawtuxet Valley 6s and $60,000 second 7s on the same line.

Trains last year ran 833,865 miles, carrying 1,581,740 passengers 30,573,526 miles and 492,837 tons of freight 20,489,660 miles: an increase of 11.7 per cent. in passenger-miles, and of 21.5 per cent. in ton-miles.

The earnings for the year were as follows:

	1885-86.	1884-85.	Inc. or Dec.	P.c.
Earnings	$1,237,120	$1,139 886	I. $97,234	8.5
Expenses	861,047	761,516	I. 99,531	13 1
Net earnings	$376,073	$378.370	D. $2,297	0.6
Gross earn. per mile	14 905	13,901	I. 1,004	7.2
Net " "	4,531	4,614	D. 83	1.8
Per cent. of exps	69.6	66.8	I. 2.8	...

Expenses include $26,727 for construction and equipment. Dividends received on Providence & Stonington Steamship stock amounted to $80,490, making a total net income of $456,563. Interest payments (less interest received) were $80,918 and 8 per cent. dividends $240,000; a total of $320,918, leaving a balance of $135,645 for the year.

Maine Central.

This company owns 347 and leases 180 miles of road, forming a line from Portland, Me., to Vanceboro on the New Brunswick line, with numerous branches. The report is for the year ending Sept. 30.

The company has $3,603,300 capital stock and $26,092 old stock and scrip. The funded debt is $11,125,400.

Trains ran 1,769,161 miles and locomotives 2,492,336 miles last year. There were carried 1,268,409 passengers and 863,711 tons of freight.

The earnings of the year were as follows:

	1885-86	1884-85.	Inc or Dec.	P. c.
Earnings	$3.001.076	$2,847,607	I. $153,469	5.4
Expenses	1.820,740	1.730,902	I. 89,838	5.2
Net earnings	$1,180 336	$1,116,705	I. $61,631	5.7
Gross earn. per mile	5,695	5,403	I. 292	5.4
Net " "	2,240	2,119	I. 121	5.7
Per cent. of exps	60.7	60.8	D. 0 1	...

Interest (less $7,400 received) amounted to $699,729, rentals of leased roads to $189,000 and dividends (6 per cent.) to $215,578; a total of $1,104,307, leaving a surplus of $76,029 for the year.

Extensive renewals and many minor improvements were made during the year, all work done being included in the working expenses.

Wilmington, Columbia & Augusta.

This company owns a line from Wilmington, N. C., to Columbia, S. C., 189 miles. The road is leased to the Wilmington & Weldon Co., but its operations are reported separately. The report is for the year ending Sept. 30 last.

The company has $980,000 capital stock. The funded debt consists of $1,660,000 first mortgage 6s.

The earnings for the year were as follows:

	1885-86.	1884-85.	Inc. or Dec.	P. c.
Earnings	$676.756	$671,973	I. $4,783	0.7
Expenses	500,278	455,405	I. 44,873	9.8
Net earnings	$176,478	$216,568	D. $40,090	18.5
Gross earnings per mile	3.581	3,554	I. 27	0.7
Net " "	934	1,145	D. 211	18.5
Per cent. of expenses	73.9	67 8	I. 6.1	...

Interest on bonds amounted to $96,000 and dividends (6 per cent.) to $57,600, a total of $153,600, leaving a surplus of $22,878 for the year.

The gauge of the road was changed from 5 ft. to 4 ft. 9 in. in June.

The Central Railroad of South Carolina (40 miles) which is leased jointly by this company and the Northeastern Co., earned last year $90.536. The expenses were $61,351, leaving the net earnings $29,185. The rental is $31,000, leaving a deficit for the year of $1,815, half of which is borne by the Northeastern and half by this company.